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EDITORIAL NOTES.

Gas Strike Settlement.

YESTERDAY morning a conference comprising fifty-four representatives of the Unions affiliated to the Federation of General Workers, comprising representatives of the Executives of the Unions, the Regional Councils, and the Workmen's Side of the National Industrial Council, was held; and, just before we went to press, Mr. James O'Grady, M.P., the Secretary of the Federation, was able to announce that the terms which had been agreed to at a meeting (which lasted upwards of three hours) the previous Wednesday with representatives of the Gas Employers' Federation had been accepted. The terms are as follows:

(1) The employers agree to pay 1s. per day, or per shift, from and including May 1, 1920.

(2) (*a*) *Holidays (National Minimum)—Works Employing More Than Ten Workmen.*—Shift and other gas workers to be granted, upon completion of twelve months' service calculated from June 1, a holiday of one normal working week at plain-time rates, inclusive of war-wage advances—such holiday to be taken consecutively if desired by the employee, and at the convenience of the management. Full holidays as above will be allowed to all men who have not lost a total of more than seven shifts for shift workers, or six days for day workers, during the year immediately preceding the holiday period, provided the time lost, with leave or by reason of sickness, shall not be included in calculation of lost time. Six months' consecutive service in any year will entitle an employee to three days' holiday; and service in excess of six months up to twelve months, one day for each additional two months of service.

(*b*) *Works Employing Ten or Less Workmen.*—While recommending holidays as above, it shall not be obligatory that the holidays should be on consecutive days.

(3) That payment for work on Sundays to all workers be at the rate of time-and-a-half for twenty-four hours except in cases where the Sunday shift forms part of a six-shift week.

(4) That in the case of day workers time-and-a-quarter be paid for the first two hours, and time-and-a-half afterwards, each day to stand by itself, subject to forty-seven hours having been worked that week; the exception being that time-and-a-half be paid for the twenty-four hours on Sunday.

(5) Where conditions are better than the above, no change prejudicial to the workmen shall be made.

The proposed terms were discussed clause by clause; and afterwards a series of resolutions was passed. The first one was: "That this representative gathering of the interests "concerned accept, on behalf of the members, the report "of the Negotiating Committee, and their recommendation "of the employers' offer, as a settlement of the original "petition, and that the information be conveyed to the em-"ployers that the strike notices are withdrawn." A further resolution was agreed to: "That we recommend the "Executives of the affiliated Unions in connection with the "gas industry not to sanction or authorize a strike which "aims at repudiating this agreement." It was also agreed: "That the Negotiating Committee still sit in session with "a view to arranging any differences that may arise out of "the interpretation of the agreement."

This brings to an end a dispute which at one time looked like precipitating the gas industry into trouble of unparalleled magnitude with the workers. Hitherto individual gas undertakings have had to meet strikes; but in this case the demand and the threat of a strike were on national lines. This made it a more imposing and a more difficult matter. But this may be said, that we fully believe there has been an earnest desire on both sides to avoid conflict if a mutually fair way out could be found. An agreement (those who have been behind the scenes know full well) was an absolute necessity for more than one reason. Time denies the opportunity for further comment this week.

The Bill Moves Forward—Looking Ahead.

THE Gas Regulation Bill, in our opinion, has now passed the most hazardous part of its journey, although there ought not to be any hazard attaching to a piece of legislative work designed to bring about a reformation, and to right what is in the new conditions an absolute wrong. After the critical examination the Bill has had in the House of Commons, its passing through the Lords need not be anything more than a formality. According to programme, third reading was given to the measure in the Commons on Tuesday after bestowing upon it a final polishing, but nothing of a serious nature, or that affects it radically. But in view of the modifications, extensions, and so forth that have been made since the Bill was first introduced, it will be well, as soon as we know definitely that the measure is in the form in which it will appear in the Statute Book, to publish it *in extenso*, for the information of the whole gas industry, as we published it [May 25 issue] in its original form. The railway companies and the motor industry made (as they did when the measure was before the Standing Committee) another effort—the former to obtain special privileges in regard to pressure and the shifting of the whole burden of the cost of altering gas-fittings upon the gas suppliers when any migration is made from one declared calorific value to another, and the latter to give to the Board of Trade mandatory powers in respect of the extraction of bye-products in the public interest. The latter proposal can be condensed into the word "benzol," and can be dismissed with the remark that the fresh attempt was unsuccessful.

The railway companies' provisions were also (it was gathered from Mr. Bridgeman) unacceptable to the Board of Trade; and Sir F. Banbury would not risk putting them against proposals which the Board considered to be preferable, and not, though protective and in the nature of a compromise, so far-reaching as those of the railway companies. Sub-section 2 of clause 2 provides for pressures being 2 in. in any main or in any pipe between the main and meter which has an internal diameter of 2 in. Subjoined to this now appear the words: "And different minima may be "specified for different parts of an undertaking, or for gas "of different calorific values." There is nothing obligatory there; but if good cause can be shown for differences, then the Board have authority to grant them. Another insertion provides that the Board of Trade may safeguard existing statutory provisions relating to pressure which are in excess of those prescribed by the present measure. A change which is only fair to gas undertakings has been made by an addition to sub-section 4 of clause 5—the extension providing that the gas examiner shall, in cases where the testing-place is situated elsewhere than on the works of the undertakers, give the latter reasonable notice of the time at which he will attend the testing-place. On the other hand, there are little changes which are intended to keep the gas undertakings up to their obligations—for instance, in respect of forfeited money owing to deficiency of calorific power. Such money is in every case to be shown in the accounts of the undertakers as a separate item until the undertakers have satisfied the Board of Trade that it has been applied to a reduction in the price of gas to the consumer—the object, of course, being to prevent the money (so little is it considered that gas undertakings are to be trusted!) eventually finding its way into the hands of the shareholders.

There was a matter held in suspension. It was as to whether or not non-statutory concerns should come under

the new Act. As was pointed out in last week's issue, there is argument both for and against. Mr. Bridgeman realized this, and promised that, before the report stage, he would consider whether or not it would be a proper thing to change the policy of exclusion which the Board had already adopted. At the report stage, he made no reference to the question; and this is an indication that the Board are not prepared to extend the provisions of the measure to any but statutory concerns. All statutory undertakings will before long come under its powers. If they do not make the necessary move, then the Board have authority to take (after the Act is passed) the initiative in applying the Act to them. The non-statutory undertakings will, in order to make use of the heat-unit basis of working and charging, have to convert their position to a statutory one. It may be taken as certain that experience in other quarters will induce local authorities to apply pressure to such companies to take steps to bring themselves under the new legislation.

It will be noticed that the non-gas-supplying local authorities have taken no prominent part in the work of amending the Bill. But it must not be anticipated that they will not emerge from their retirement when applications are made to the Board of Trade, so as to secure what they consider the best possible terms for the consumers. Whatever appearances are threatened in this connection by local bodies (to whom, as will be seen by the Bill, notices of applications are to be given) will not deter gas companies from making application under the Act, as sooner or later they will have to comply with its decrees. Moreover, the Board have wide powers of determination of a judicial character; and it will be far better to argue a case before the Board than to agree to terms that are unfair to a company. In the first instance, too, it would be better for a few leading cases to be submitted and argued before the Board, as then we may get some indication as to the principles on which decisions will be made. This will or should ease local negotiation.

We are writing thus, though the Bill has still further to go before it becomes a usable instrument, because it is as well now to begin to look forward. We ought also soon to have some indication as to who are the Referees and Chief Gas Examiner designate, as the sooner they begin to deliberate over and resolve upon their prescriptions, the sooner will it be possible, after the measure becomes law, to put the machinery to work, because there will have to be some expenditure of time in manufacture and installation of instruments, and getting on to lines of normal working. In this connection, a short but suggestive article appears in another column from a correspondent who is perfectly disinterested in the matter, but who desires the Act to be a genuine success in the interests of the industry and the country. The article deals with a matter referred to in one paragraph of an editorial last week; and the reference was the result of a conversation with our correspondent. We are glad he has himself extended his views, which we thoroughly endorse.

[The Bill was read the first time in the House of Lords last Wednesday; and is down for second reading to-morrow, Thursday.]

Vagrant Electric Currents and Gas-Works Plant.

Far be it from us to be alarmists; but there is virtue in issuing warning that may be, and we are confident will be, of material value. There is an article in a later part of this issue by Mr. H. C. Widlake on the effects of stray electric currents on gas-works, and how to avoid their wasting action upon gas-works plant. Electrical energy is a good servant, but an insidious enemy. There are few engineers of gas-works of any importance that, owing to the character and operation of much of their plant, would be without the electric drive; and yet there may be many gas-works that, through the electric drive and owing to vagrant currents, are suffering depreciation of their metal structures at an accelerated rate. At any time anything that can be done to retard the rate of plant depreciation, it is up to the management to effect; but in these times of high costs for maintenance and renewal, the responsibility becomes much greater. Hence there is very good reason for paying special attention to the matter that Mr. Widlake raises in his article; for we undertake to say that there are a good proportion of gas engineers who have never given a thought to the question, and so have not made inquiry as to whether or not the introduction of electricity on to their works has had anything to do with the faster rate at which parts of metal structures have been perishing. As Mr. Widlake points out, structures on gas-works and their connections make ready paths for stray earth-currents. He illustrates the damage that may be caused by these by reference to serious injury done to a set of condensers, which had to be retubed seven years before the normal time; and it was not until after the renewal of the tubes that suspicion arose and investigation was made which placed the rapid deterioration to the account of electrolytic action. The article does three things. It suggests to gas engineers with electrical plant on their works to make a thorough investigation to ascertain whether the metallic structures are the victims of wandering electric currents; it supplies suggestions as to how trouble may be avoided; and it urges engineers who are adopting electrically operated plants to have expert advice, and afterwards (too much stress cannot be laid upon this) competent supervision. Where complete confidence does not exist as to freedom from damage by stray currents, then engineers will be well advised to have an expert survey made of the plant. A few pounds spent now may, perhaps, save thousands.

Why not Underground Storage for Coal?

The members of the Société Technique du Gaz had a programme of a varied nature to consider at their annual meeting which has been held under the presidency of M. Laurain. Our French colleagues had to face during the war—and they have faced them well—difficulties and problems of the gravest character to the levels of which our own difficulties and problems, bad as they have been, have fortunately not ascended. In the midst of them, they have, as we have here, had to consider more economical production and practices; and the results are much on our own lines regarding the realization of a higher return of B.Th.U. per ton of coal handled and carbonized. Universally the gas industry, for economic reasons alone, is bound to travel the same way. Two of the papers read at the meeting particularly attract our attention for the practical lessons that they embody. One of them, by M. Forrières, deals with the preservation of coal by underground storage; the other, by M. Guillemé, treats of vertical retorts for small gas-works.

Dealing with the storage of coal first. Every gas manager desires to preserve the gas-making properties of stored coal as much as possible, and to prevent spontaneous ignitions in the stacked coal. These questions and the general one of coal storage have become more important than in the years preceding the war. The labour signs of the times suggest that coal stocks will have to be measured by larger figures than in the past. This is unfortunate with the cost of money and labour what they are, and coal at higher prices than formerly; but there is little question that coal stocks (if they can be obtained) will have to go up quantitatively, and thus in value the same as other things. It is hard to change some habits and practices; but we must be prudent, and measure things not by defunct conditions, but by the new. Gas engineers bemoan their fate in this respect, and point to the idle money there is in the coal stock, and the increased expenses incurred in storage, and in removing from store. We sympathize; but part of the responsibility of a gas manager is not to leave undone anything that can reasonably be done to protect the continuity of gas supply. Another objection to larger stocks is the space required for them, which some works can ill afford. Space is for many a very important question. To-day, however, mechanical storage is largely the practice in gas-works; and yet we see that the storage accommodation is much of the same order and character as in days long since. Coal-stores are built at ground level, and there is supplementary open-air storage. The point is not made by M. Forrières, but why not excavate, if the saving of space is a consideration, and so increase storage below ground level? Mechanical operation makes this a much easier problem than it was formerly; and it has the accompanying advantages of preserving the gas-making qualities of coal, and protecting it against fire.

These two last-named considerations are the ones to which M. Forrières directs attention in advocating underground storage. In the past few years, our knowledge as to the conditions contributing to the spontaneous combustion of coal has extended. We now know how air-currents passing through coal, and so constantly supplying oxygen to it, set-up and promote heating, with very unpleasant and oftentimes costly consequences—more costly now with the price of coal at the figures of to-day. There is thus much

greater necessity than ever for preventing the passage of air-currents through stored coal. The attention of M. Forrières was directed to this matter by the possession of three coal-stores—one three-sided, and two with both ends open. It was (and naturally) in these two latter that he had much trouble from spontaneous combustion, without special means being applied to prevent the circulation of air—seeing that coal-stores with parallel walls and open ends simply supply a channel, and so promote air-currents through the coal. Coal dust mixed with the larger coal is a preventative of air circulation through the coal; but in stacking some types of coal, this is not a condition that can be well satisfied, nor is it desirable from a coal-carbonizing point of view if the coal is to be used in vertical retorts with steaming. Our French colleague, however, suggests that coal which has to be stacked for a long time should (if not in a totally enclosed building) be covered with a layer of coke dust, and that if blocks of coal or any other means of external protection are used at the sides and ends an inner lining of coke dust should be put in, to obstruct the passage of air through the coal.

But these advantages can be gained by the underground storage of coal; and an experiment that M. Forrières has made, and which the terrible war made longer than was intended, convinced him that coal can be preserved in respect of quality and from spontaneous combustion by this means. An opportunity came in 1912 of storing 212 tons of coal in a rectangular excavation, some 13 ft. deep. This stock was covered with fine coal, and the ground was levelled by laying clayey soil on top. The works were occupied by the Germans in October, 1914; and it was not until Sept. 25, 1917, that the then acting French manager (M. Forrières having been mobilized in 1914) had to have recourse to the hidden reserve. The quality of the coal was found unimpaired; the makes from it were much better than from the war-time delivered coal; and it did not cause a minute's uneasiness through heating during its five years' incarceration. The only suggestion that the acting manager had to make was that it would have been better for gas-making purposes if the coal had been simply covered by coke dust, as the admixture of soil with the coal during its removal was some disadvantage. This is an interesting experience, which has several lessons for consideration in dealing with the question of long-duration storage, and the preservation from harm of the stored coal.

Vertical Retorts for Small Works—Steaming and Volatile Matter in Coke.

MANY a manager of a small works looks enviously upon the managers of larger works who have installations of vertical retorts, and are reaping the advantages of steaming. The idea appears to have got strong hold that vertical retorts are beyond the bounds of practicability for works of small productions. We have never been able to see why or how such a view got abroad, except in respect of works the demand upon which is of an exceptionally modest order. When we remember the results that were obtained years ago with experimental vertical settings, these results and the size of the settings should alone have satisfied that the lower limit of their application was far down in the scale of magnitude as measured by output. M. Guillemé, in the second paper referred to in the preceding article, presents a very strong case for the consideration, by the managers of quite small works, of the intermittent vertical retort as an aid to economy, even in their restricted circumstances. The works that the author has in mind indeed deserve the description of "small"—using only 3 tons of coal per day, and making from 35,000 to 42,000 c.ft., or 11,700 to 14,000 c.ft. per ton. He writes from an experience of thirteen years; so his opinions and conclusions are worthy of the fullest respect. All he says, and the fact that experience covers not one works only but several, show that the vertical retort is equally applicable to small works, even (according to the writer) more valuably so than the horizontal. An early objection to the use of vertical retorts for small gas-works was that the units were too great to harmonize with the varying seasonal requirements of a modest district. But this has been altered. It is all a question of the design of the heating arrangements; and dampers are useful things in aiding retort segregation. Retorts arranged in groups can be perfectly independent in working, though heated by a single furnace; and the regulation of the heating and the consumption of fuel can have direct relation to the number of retorts to be worked. Another important thing is wear and tear. M. Guillemé has had reports from several small works in which vertical retorts have been in continuous use for about four years; and they show that retorts which have seen forty-eight or fifty months' service are still in use. To summarize the points that the author makes in recommending the vertical system to the consideration of the managers of small works, they are: Greater yield of gas, improved quality of both gas and bye-products, economy of labour, low production of naphthalene, longer life of retorts and furnaces, and the production of water gas, which reduces the quantity of coal used per unit of gas production, and so lessens the labour on the works. It is seen that the author has a fancy for gas of 4700 calories per cubic metre as being suitable for all general purposes—that is to say, a gas of about 420 B.Th.U.

The explanation of M. Guillemé as to the quality of the gas when steaming is the usually accepted one—"that the "steam, when admitted during the period of carbonization, "generates water gas which, as it is formed, takes up hydro-"carbons from the coal gas, also penetrating the pores of "the coke, and removing volatile products from it." This recalls the remarks of Dr. A. Parker in his report on the Uddingston experiments, which introduce the investigation into the comparative economies of production of different grades of gas, from the thermal and chemical standpoints. Dr. Parker, in referring to the volatile matter values obtained in the coke from five different tests, says his view is that temperature more than steaming is responsible for the variations in the volatile matter, and that the gas quality values obtained where steaming is practised is due to the minimizing of certain secondary decompositions in the tar and the volatile products. This is exactly what Dr. Parker remarks: "The values obtained do not lend support to "the prevalent idea that the sweeping action of the steam "is conducive to a much more complete removal of the "volatile matter, but rather do they lead to the conclusion "that the amount of volatile matter remaining in the coke "is dependent mainly on the highest temperature to which "the coke is subjected inside the retort. The presence of "steam and the resultant water gas would minimize certain "secondary decompositions in tar and other volatile pro-"ducts. It would also aid the preservation of compounds "so readily decomposed as ammonia, partly by reason of "the fact that dilution affects the position of gaseous equili-"brium, but mainly by reason of the more rapid removal of "the gases from the high-temperature zone." In the mass of other matter contained in Dr. Parker's valuable report, the point he makes in this quotation may have been overlooked; but M. Guillemé affords the opportunity for giving it necessary prominence, as many people have concluded that steaming, by the removal of volatile matter, depreciates the burning value of the coke. The extent of the steaming would, of course, indirectly influence the amount of volatile matter in the coke, as steaming beyond the levels to which Dr. Parker's trials went would have meant higher temperatures inside the retorts to ensure the decomposition of the steam; and the "volatile matter remaining in the coke is "dependent mainly on the highest temperature to which "the coke is subjected." The paper by M. Guillemé should redirect the minds of the managers of small works to the subject of the application of vertical retorts to their special conditions.

Misuse of Gas Appliances.

We have not much interest as to where medical practitioners are born; but one who is an Englishman, and was born in Scotland, has been rather interested in observing that, in the homes of the people of the town in which he has practised, gas appliances are very much misused, through want of knowledge as to how to use them properly. He has written to us on the subject; and while he recognizes the good work done by the British Commercial Gas Association, he holds that the gas undertakings of towns have much to do in educating the housewives as to how to handle their gas appliances correctly so as to get right combustion and efficieney. Given this, he knows of no handier means of satisfying the heat requirements of a household. His experience must be a very sad and exceptional one. Everything points to its being so. If the air of houses was usually in the polluted condition through the use of gas that he says is the case (and we know from very large experience and experiment that it is not), then there would be a much larger indication of it in the impair-

ment of health and in the mortality statistics of the country. As a matter of fact, statistics have been published which show the extensive use that medical practitioners themselves make of gas-heating appliances to-day; and they would not do this if our correspondent was right. Of course, he may say in reply that in the homes of medical men, care is exercised that the appliances are used properly. Other evidence is that many undertakings have not been able to keep pace with the demand for gas appliances This demand comes not from the experiences related by our correspondent, but from satisfaction born of experience. He also indicates his opinion that thousands of gas stoves and cookers have been fitted into the dwellings of this country, and that almost half of them are seldom or never used. Now what are the facts? Before the Fuel and Lighting Rationing Order came into force and since its withdrawal, the average consumption of gas by ordinary consumers and prepayment consumers (taken separately) has increased. This is not due to gas appliances lying derelict, but to their use. It seems to us that our correspondent's experience must be very exceptional, and that ignorance is not so prevalent as he makes out. The facts—speaking generally, and not of any particular town—are against him. But where ignorance as to proper use does exist, we are with him that education is wanted, and that is a matter for gas undertakings. We are sorry our correspondent has published his letter anonymously.

Cheerful Times.

We are living in cheerful times. Second reading was given to the Ministry of Mines Bill last Wednesday by 217 votes for and 91 against, which falls far short of the numerical glory of the House of Commons. A considerable proportion of the ninety-and-one do not like the Bill because it does not provide for nationalization. The remainder of the number are objecting to it because it has in it the germs and spirit of nationalization, and makes permanent a good measure of Government control over the industry. The Miners' Federation are proposing to consider what measures it shall take to bring a stupid Government and country to their senses, and make them accept the nationalization nostrum that has been prescribed by Messrs. Smillie & Co. for curing all the ills of the mining industry, particularly of the miners. There are others in the same galley, who are telling a much-lashed country that, unless the Government take 14s. 2d. off the price of coal to domestic consumers, a national strike of miners shall be brought about, and so prevent domestic consumers, industries, and everybody else obtaining coal even though they desire to buy at prices fixed by the Government. As we say, these are cheerful times, and the Miners' Federation, in its autocratic attempt to override the rights of democratic government, help to make them so.

The Coal Mines Bill.

The Ministry of Mines Bill was introduced for second reading by the President of the Board of Trade (Sir Robert Horne). He explained what is now well known, that a new department of the Board of Trade is to be created; and the principal tenant will be known as the Minister of Mines. To him will be delegated all the existing powers referring to the coal industry; and he will continue Government control by regulating pithead prices, determining the amount of coal to be exported, and give directions for dealing with rates of wages. The polemical question of the nationalization of mineral rights is to be deferred to a more convenient season. We heard of the National Boards, the Area Boards, and the District and Pit Committees. One of the principal functions of the Area Boards has provoked great opposition from the men's leaders. These bodies are to have the thankless task of formulating schemes for the adjustment of the remuneration of the men on the basis of the profits of the industry in each area, and not as at present on the selling price; and the National Board are to lay down general principles so that the rate may be, as far as possible, uniform throughout the country. It is obvious from what Mr. Brace and others said during the discussion that they do not like this shifting from selling price to profits. Wages they also contend must be adjusted on a national and not a regional basis, seeing that the profits per ton vary so much as between different areas. They cite the railways, in connection with which a National Board has lately been created for settling wages on a national basis. To deal with wages on only a national basis seems now a policy generally approved by the Trade Unions. Incidentally we see that the miners' representatives in the House blame the coal owners for shortage of output through not developing the mines; but this does not explain why so many more miners are employed to raise an amount of coal many million tons below the 1913 output. Coal-mine owners are as antagonistic to the Bill as the Miners' Federation, but for totally different reasons.

An Unprofitable Year.

From the report of the General Federation of Trade Unions, it is seen that the membership shows an increase of 265,000—there being now 134 unions affiliated, with a membership of 1,480,108. The funds, however, show a decrease of £133,872. This is bad business. The total income for the year was £94,534; but the Federation paid in strike benefit no less than £219,692. That is the way of bankruptcy. The futile moulders' strike cost the Federation £62,628. One strike soon makes a big hole in accumulated funds, when it comprehends an industry and not merely a single works. This is where leaders begin to find dealing with matters on a national basis rather an expensive and (if trouble comes) fund-exhausting operation.

Centralization of Trade Union Activities.

A development upon which attention will have to be kept is the scheme formulated by the Trade Union Co-Ordination Committee for centralizing trade union activity. The Parliamentary Committee of the Trade Union Congress has considered it; and it comes before the Congress at Portsmouth in September. The proposal is to dethrone the present Parliamentary Committee, and substitute a Trade Union Congress General Council, with administrative departments—the latter under the joint control of the Congress, the Labour party, and the co-operative movement. Branches are to be formed for research, legal advice, and publicity. The General Council will consist of thirty members, representing seventeen trade groups. The subdivision of the Council seems to cover practically every industry. The General Council is to watch all industrial movements, promote common action on general industrial questions, use influence to promote settlements when disputes arise, assist trade unions in the work of organization, carry on propaganda, and enter into relations with the trade union and labour movements in other countries with the view to promoting common action and international solidarity. This is a movement worth watching. It can either assist, or bring chaos to, the industrial interests of the country.

Cast-Iron Pipe Made with Electric Furnace.

A new product—in the form of the M'Wane Prepared-Joint Electric Cast-Iron Pipe—which is a method of manufacture they have been experimenting on for five years, has been announced by the American Cast-Iron Pipe Company, of Birmingham (Ala.). It is stated that the iron for this pipe is superheated in an electric furnace. Experiments have shown that uniformly high-temperature iron was the secret of making light-weight pipe to withstand the same pressures as thicker-walled pipe of the present standards. Though it is found that high-temperature iron cannot be produced satisfactorily and dependably in cupolas, with an electric furnace uniformly high tensile strength castings were made. Molten iron from both the cupola and the blast furnace are combined in the electric furnace to obtain the proper analysis; and then the temperature of the mixture is raised to a higher degree than is possible in the cupola. The high sulphur increment which is incident to cupola iron is thus avoided, and essential metalloids usually lost in cupola practice are saved. Undesirable gases are freed from the metal by the agitation set-up by the electric current; so that the chemical properties, as well as the temperature of the iron, are better controlled by the electric current passed through the furnace arcs. The result is a molten iron mixture low enough in carbon and silicon to ensure high tensile strength, and hot enough to make good thin-section castings. The standards usual for electric pipe are: Tensile strength, 30,000 lbs. per sq. in.; transverse strength, 2600 lbs.; deflection, 0·38 in. After several years spent by the research department of the Company in seeking a simplified and more efficient joint, the M'Wane prepared joint has been evolved. To make a joint in the trench with this factory-made joint, it is necessary only to insert a plain end into a bell, and caulk the lead. It is constructed on a new principle which makes it tighten when deflected. The joint is made at the factory by standing the pipe on the spigot end, and inserting a mandrel into the bell. A band of iron wedges held together by a strip of lead is first inserted around the mandrel. Two layers of square hemp, specially braided for the purpose, are next inserted and caulked on the top of the wedges. Then hot lead is poured into the joint, and the mandrel extracted—leaving all the joint materials in place. A concrete plug is inserted, to protect the joint materials in shipment.

PERSONAL.

Mr. R. G. SHADBOLT, who has relinquished the offices of Manager and Secretary to the Grantham Gas Company to take up private practice as a Consulting Gas Engineer, &c., has removed to Birmingham, where his business address is Central House, New Street.

Consequent upon the retirement on superannuation of Mr. C. B. OUTON from the position of Lighting Engineer of the Great Southern and Western Railway of Ireland, a very pleasant function took place at the Railway Institute, Inchicore, last Saturday week, when the staff took the opportunity of presenting him with a valuable solid-silver salver of Celtic design, suitably inscribed, and an illuminated album containing the names of the subscribers. The presentation, in the unavoidable absence of Mr. Watson (Chief Locomotive Engineer), was made by Mr. G. D. M. Beard, who spoke of Mr. Outon's general good-fellowship and courtesy. Complimentary telegrams and letters from all over the system were read. Several speakers made reference to Mr. Outon's qualities and intellectual attainments.

Messrs. Bale & Hardy, Ltd., have made arrangements whereby the services of Dr. R. LESSING have been retained by them, as Consulting Chemist, in connection with their "Tully Plants," and those of Mr. R. G. SHADBOLT as Technical Adviser in the same connection.

Mr. H. PRESTON LUPTON, a former pupil of the Burnley Gas Engineer (Mr. J. P. Leather), and later Junior Assistant Engineer, has gained his B.Sc. degree at Leeds University.

ELECTRICITY SUPPLY MEMORANDA.

THE annual convention of the Incorporated Municipal Electrical Association was held this year at Ilkley; and the President was Mr. T. Roles, the Corporation Electrical Engineer of Bradford.

Right Lines of Evolution.

We admire a man who has the courage of his convictions; and among the convictions of Mr. Roles is that the Electricity Supply Act of last session wants amending by the passing of the Bill of this session, which proposes to give statutory existence to the parts of last year's measure that were suspended owing to hostility. Mr. Roles knows that there exists a heavy mass of opinion contrary to his views. Judgment is very general that the present Act is sufficient—at any rate for the time being, as it enables evolution of electricity generation upon the lines that are the most sensible, without attempting to jump at an enormous outlay to the ultimate ideal goal, which current conditions do not favour. To essay revolution would, instead of being a help to the electricity supply industry, simply cripple it, by piling on it a load of capital obligation, which would retard its rate of progress. That is a thing to be avoided. Mr. Roles has no desire for this sort of thing; but he wants the compulsory powers to be in the hands of the Electricity Commissioners. He agrees that the immediate demands might be met by extending the existing efficient stations, and linking together those that are highly efficient, and within reasonable proximity to each other, by means of transmission cables; while the less efficient ones should be operated for as short a period as possible. Then the next step should be the erection of capital stations, which should be run at a high load-factor; while the most efficient of the existing stations should be operated at moderate load-factors. The smaller and less efficient stations should only be utilized at peak loads, or be otherwise dispensed with. These are precisely the proper lines; and on them a definite system of generating electricity would be evolved. They are the lines along which the Electricity Commissioners are proceeding. In regard to these particular views, most people who have studied the question will be in full accord with Mr. Roles.

Compulsory Power a Driving Force.

The Government are of opinion that the new Bill is necessary. Whether the Government are supported in their views by the Electricity Commissioners is not yet known; but presumably they are, as they are so persistent. Anyway, Mr. Roles supports them; and for, in his opinion, very good reasons. He is of opinion that the measure should receive the blessing and all the aid that the local authorities can give it; but the local authorities seem, with almost one accord, to be inclined the other way. And the Bill will find heavy obstacles in its path—perhaps of sufficient weight and strength to wreck it. Mr. Roles agrees that the compulsory purchase clauses might be amended, but that the compulsory powers of purchase ought not to be dropped, or even delayed. His contention is that, unless the compulsory powers exist, there will be no means of dealing with obstructive authorities. But it would be just as well to inquire why there are authorities that are obstructive. The main reason seems to us to be that their belief is that there is more incentive to a local authority to do the best possible within its own area than if it is only one of a number of local authorities generating electricity in combination for a large area, and whose discussions and decisions will necessarily be slow. And what combination may be able to do in generation will have to be discounted by the increased costs of, and losses in, distribution. By the way, voluntary co-operation between local authorities in areas that are suitably circumstanced for joint generation is growing. We see the Commissioners have given notice that they have provisionally determined that certain districts in the West Riding, in South-East Lancashire, in the County of Chester, and in the County of Derby shall be constituted separate electricity areas. There are also several voluntary schemes that have been submitted to the Commissioners, and into all of them inquiries are to be held to hear the case for, and (if any) the objections to, them. This is where Mr. Roles thinks the compulsory powers in respect of purchase of generating plant and transmission lines and the establishment of district boards are essential, if the Commissioners are to enforce in the face of unreasonable opposition the carrying out of what, in their judgment, is a desirable scheme. But who is to determine whether or not opposition is unreasonable? A town that can see its way to benefit its own people by its own initiative and resources to larger extent than by sharing in the products of a co-operative generating scheme would be justified in raising objection to inclusion, though its inclusion might benefit other towns. This is where in these large schemes individual cities and towns may suffer—through sinking their individual advantageous conditions in a common pool in respect of generation.

Rational and Irrational Finance.

The financial clauses of the amending Bill are, according to Mr. Roles, its most important part, as "it has become clear to all who have been considering the setting-up of joint electricity authorities that the finance of such authorities is impracticable until some such provisions as are contained in the clauses are made." The objects of the clauses are to empower joint electricity authorities who are constituted under the existing Act, as well as the district electricity boards contemplated under the Bill, to borrow money, and to authorize the issue of stock. So far so good; there is no particular objection to this. The clauses will also allow authorized undertakers to give financial assistance to joint electricity authorities and district electricity boards. There is no objection to this, provided the ratepayers who are not electricity consumers are protected against loss. There is, however, strong objection to the proposal that the Government should find the money for the Electricity Commissioners to lend to the joint authorities or district boards. The Government have no right to enter upon the speculative road of industrial financing; and no sound reason has yet been advanced as to why there should be in this respect preferential treatment of the electricity industry. There is no real occasion for it. There are numerous other industries that could do with loan capital from the Government; and why not them if the electricity industry? The Government seem to have lost their heads completely over electricity, and all through the very misleading report made by the Power Sub-Committee of the Coal Conservation Committee. Quite apart from the question of principle, the Government ought not to indulge in the financing of industrial enterprise, with the country's financial conditions as they are; nor is it the time for municipal authorities to commit themselves, with the price of everything on which capital will be expended at about peak-point, to heavy expenditure on schemes other than those that can be shown to be requisite from the economic and indispensable points of view. As we say, we admire Mr. Roles for his courage in defending the clauses which have provoked so much hostility; but we do object to compulsion overriding individual effort, to Government intrusion upon the financing of industrial enterprises, and to electricity being treated preferentially. What the Government should do now is to insist upon making municipal electricity supply self-supporting. This is their boasted policy in respect of the coal industry. If the electricity industry requires philanthropic treatment, then it must be in a bad way.

Increase of Charges and Labour.

Reference was made in the "Memoranda" for June 8 to a novel proposal by the Home Counties (No. 9 Area) Joint Industrial Council for the Electricity Supply Industry It was that the statutory charges authorized for electricity supply undertakings should be increased where necessary to such a degree as to enable them to pay such wages as are agreed upon by the Industrial Councils to be proper and reasonable, and that the Minister of Transport should embody an instruction that such increase should be devoted to such purpose. There was a deputation on the subject to the Electricity Commissioners; and now the Ministry of Transport have sent a reply which, put briefly, informs the Industrial Council that what they suggest cannot be done. Labour has been getting very much its own way lately; but labour should be just. There are other interests to be considered as well as their own. As soon as one begins in industry to act preferentially for one interest to the detriment of other interests, things are bound to go wrong. Labour may take it as certain that its extreme lines are killing its own interests; for there is abundant evidence now that its operations are reducing the field of employment by diminishing the amount of work that there is to be given out. There is much work to be done that employers cannot take, because people cannot afford to pay the price that is demanded for it. Here we have a case of labour seeking to earmark the proceeds of increase of prices for itself, and not for meeting other obligations.

This is nothing but an inspiration of selfishness; and we do not believe there are really many men among our industrial workers who would in these days subscribe to such a piece of fatuous nonsense, unless they desire to make business altogether impossible. However, the reply of the Minister of Transport states that he has decided that companies seeking an increase in their maximum rates of charge may make application to him under section 32 of the Electric Lighting (Clauses) Act, 1899, instead of under the Statutory Undertakings (Temporary Increase of Charges) Act, 1918. This will enable all companies with very few exceptions to make application should this course be necessary. The few exceptions are those companies whose Orders were granted to local authorities prior to the passing of the 1899 Clauses Act, and subsequently transferred to companies; but such companies and local authorities may make application under the Statutory Undertakings (Temporary Increase of Charges) Act, 1918. The Minister says, however, that he has no power to allocate to any particular purpose any part of the sum produced by the sanctioned increase of maximum charge; but representatives of the Industrial Council can attend any inquiry, and be heard there. The Minister is also advised that he cannot restrict the grant of an increase only to undertakers who agree to carry out the recommendations of the Industrial Council.

Prepayment Meters for All Purposes.

The "Electrician" tells its readers that among modern conveniences electricity is pre-eminent; and we have no doubt that there are many of them who will believe it. The working man, it also says, no less than any other class of the community is entitled to be provided with that convenience in such a way that he can make the best use of it as cheaply as possible. As cheaply as possible! We like the words in conjunction with what follows. The Hammersmith Electricity Committee realize this submission of our contemporary; and not only propose to spend £22,000 on supply mains to the site of their housing scheme, but an additional £5000 for services on the basis of one service for every two houses. Then on top of this they propose to instal a prepayment meter in each house, to induce tenants to use electrical energy for "all" purposes. Our contemporary will be interested to see how "this broad-minded experiment works from every point of view;" so will be the working man who uses electricity through a prepayment meter for "all" purposes.

Deeper Study Necessary.

The electrical papers maintain their old attitude of bluff over the thermal efficiency question and coal conservation. They have no other course but to take to their well-worn formularies. Ever since Sir Dugald Clerk originally issued, in our columns (Feb. 10), his invitation to a discussion to the Institution of Electrical Engineers, our contemporaries have been crying with frequency and a unanimous voice that thermal efficiency has very little to do with the matter, though previously hugging with the utmost affection those grotesque figures of the Power Sub-Committee of the Coal Conservation Committee which declared on paper that 25 p.ct. or so of the coal dealt with in this country could be actually saved if the coal now used for industrial and household purposes were transferred to the treatment that the electricity industry would mete out to it. The fallacy of this has been shown by Sir Dugald Clerk and Professors Smithells and Cobb. Our contemporary "The Electrician" takes refuge in anything that offers. It may be strongly advised to study fully the figures presented by Sir Dugald Clerk, and then state precisely what his contentions are, instead of trying to misrepresent them by such crude observations as these. "Sir Dugald Clerk's first argument is that 46 p.ct. of heat energy in the coal is delivered in the form of gas. But this figure takes credit for all the heat contained in the tar and coke; and the assumption is made that this heat can be wholly recovered." No such "assumption" is made, because even the tyro in fuel efficiencies in use knows the impossibility of converting any heating agent from one state to another without some loss. Does the editor of "The Electrician" seriously believe that Sir Dugald Clerk is going to be caught by critics on an assumption that might be expected from an elementary school boy. We imagine most people know the difference between potential heat energy, and efficiency in use. Anyway, in boiler firing a decent coke, when properly used, will give about 70 p.ct. efficiency, and with the addition of superheaters and economizers 75 p.ct. Regarding anything that Mr. George Helps may have said in depreciation of Sir Dugald's figures, perhaps our contemporary will now consider the letter that was published in our last issue from Sir Dugald, who does not give his critics much pause. Perhaps the letter will be of enlightening assistance in showing how the 46 p.ct. efficiency is actually calculated. We have no doubt that Mr. Helps is responsible for the statement that "credit is taken in a process of partial gasification of coal for a greater efficiency than a total gasification process would give." To take such credit, our contemporary says, is hardly justifiable; and instead of gas being nearly five-and-a-half times as efficient on this account, we are being generous if we admit that it is twice as efficient." As efficient as what? Electricity? However, we like the lofty generosity. But with all friendship, we would suggest to our contemporary to get at the actual facts before sinking deeper into something compounded of assumption and indifferent knowledge of the subject.

Electrical Special Pleading.

Our contemporary also accuses Sir Dugald Clerk with giving arbitrary figures for gas efficiencies, "which are most certainly not borne out in actual practice." This is a positive statement unsupported by the slightest shred of evidence. We should in this matter, too, advise our contemporary carefully to study published figures as to actual radiant efficiencies from gas-fires, the easily ascertained waste heat passing up the chimney, and then allow, as there is no other possible means of escape for it, the addition of the convected heat to the radiant heat, to give the total of the heat imparted to a room. Regarding power, our contemporary ignores the fact that the gas industry freely acknowledges that, for certain industrial purposes, where machinery is scattered or intermittently used, there is no better agent than electricity. But for work presenting long good load runs, both on the thermal efficiency and the financial bases, gas wins hands down. More muddle in interpretation is found in the paragraph of the article dealing with the production of light; but when we read that "the candle power hours obtainable from 1 lb. of coal by electrical means are more like 1000 than the 241 conceded," it simply shows the extravagance to which electrical people will go in the attempt to make good their case. There is no such thing as a half-watt gas-filled lamp. The average consumption per candle-power-hour is more like 0·7 watt. If there were "half-watt" lamps, how many electricity stations, Mr. "Electrician," generate a KW.-hour on 2 lbs. of coals? And how many are likely to, and when? Furthermore, half-watt lamps are not the lamps generally employed; and thank goodness they are not. Where they are used for indoor purposes, properly screened, the efficiency is still further removed from the candle-power-hour per half-watt. Then when we come to the question of cost for light, heat, and power, compared on a common and equal basis of light given, heat given, and power given for a definite expenditure, gas easily wins. Convenience, suitability, and economy for certain purposes and positions mark out fairly clearly the fields in each service into which the two commodities are settling-down; and this no amount of disputation, sensible or otherwise, will alter.

Proper Utilization of Gaseous Fuels.

Gas is recognized as the most perfect fuel, and as being capable of utilization at the highest efficiency; but it must be admitted that no fuel can be more easily wasted. With this remark, Mr. I. Lundgaard prefaced a paper he read at the annual meeting of the Natural Gas Association of America, and in which he drew attention to some matters that seem to him to be not always sufficiently considered. The welfare of the gas business, he said, is, and will be, in a large measure proportional to our knowledge and application of correct principles in the utilization of gas. The first and obvious step to take for the conservation of gas is to heat-insulate the space being heated. There is, perhaps, no field in which neglect of simple economics is more prevalent than in the field of heat insulation, as evidenced by an inspection of appliances offered by manufacturers. Again, practical tests have proved that the loss due to prevailing faulty combustion is appalling. The remedy lies in improved design of mixers when atmospheric burners are used, and in the employment of automatic combustion control where blast-burners are installed. A most encouraging sign of the times is the wide interest manifested in the recuperation of the heat contained in furnace exhaust gases. Recuperation in various forms has now for many years been in use for large furnaces; and it is frequently applied to even quite small ones. The possible saving is greater for the higher working temperatures; but it is amply demonstrated that recuperation pays well at working temperatures as low as 1000° Fahr. The simplest form of a recuperator is a pipe-coil installed in the exhaust flue; the air for combustion being carried through the coil, and heated by the flue gases. Another way of recovering heat from the exhaust gases is that of building the furnace in accordance with the principle of counter-current heating. Here the material to be heated moves in the opposite direction to the furnace gases; so that cold material entering the furnace first absorbs heat from the relatively cold flue gas, and as it passes forward (either by stages or by continuous conveyor movement) constantly comes in contact with the higher temperature of the furnace gases, until it reaches the point of final temperature. The radiant form of heat is most readily absorbed by the material to be heated; and therefore wherever possible the appliance should be so designed that heating is accomplished by radiation to the greatest practicable extent.

"B.C.G.A." Eastern District Conference.—There is to be held to-day, at Norwich, a Business and Housing Conference of the Eastern District Committee of the British Commercial Gas Association—under the presidency of Mr. Henry Woodall, M.Inst.C.E., the Chairman of the British Gas Light Company, Ltd., who will address the meeting. The programme includes a discussion on the work of the "Sales Organization Department," and another (to be opened by Mr. Thomas Glover) on the "Housing Problem." The visitors will be the guests at luncheon of the Chairman and Directors of the British Gas Light Company, who own the Norwich Gas-Works.

THE FUNCTIONS OF INSPECTORS UNDER THE REGULATION BILL.

By X.

AT the present time the attention of the gas industry is largely concentrated on the Gas Regulation Bill now before Parliament; for upon the enactments finally decided upon—both in respect to the financial clauses and to those concerning the method of charge, restrictions as to composition and purity of gas, &c.—the future of the industry will very largely depend. The main effort at present being made is rightly to ensure, as far as practicable, that the decisions come to shall be such as shall conduce to the mutual advantage of the consumer and of the industry itself.

But however successful Parliament may be in drawing-up regulations in these latter respects, the full success of the enactments will largely depend upon the spirit in which the Act is administered. An Act of this kind may be quite satisfactory; but it may be easily made unsatisfactory by unwise or ignorant administration. On the other hand, even if defective in certain respects, the defects can largely be obviated by wise administration. Looking forward, therefore, to the time when the Act comes into force, it is most desirable that the administration shall from the start be such as will bring about the desired end with a minimum of friction.

While looking forward, it is well to look backward also, and learn what past history has to teach. Such a retrospective glance teaches the lesson that, with any such Act controlling an industry, the successful administration depends to a very large extent on the personality of the man who is appointed as the first virtual (if not nominal) head of the administration. Instances will occur to all readers of both successful and unsuccessful administrations; and among the former, there will be general agreement that no Act controlling an industry has been more successfully administered than the Alkali Act. That some friction has at times occurred in respect to this, and is inevitable with any such administration without a material alteration in human nature, is true. But, by general consent, such friction has been relatively small; and the gas industry, which in part of its work comes within the control of the inspectors, has frequently and with no uncertain voice expressed appreciation of their work.

In this success, the most important cause was the personality of the first Chief Inspector appointed under the Act—the late Dr. Angus Smith. He at once introduced into the administration a spirit which has been faithfully followed by his successors—Mr. A. E. Fletcher, Dr. Forbes Carpenter, and Mr. W. S. Curphey. To define a "spirit" is not an easy task, as human characteristics come in which are not capable of ready definition. But generally it may be said that the principle on which the Act has been administered has been that the inspectors have regarded themselves not merely as being there to see that the provisions of the Act were duly carried out, but also as being there to give every assistance that they could in doing so. To this end, they have throughout the whole period themselves carried out original work which has been most helpful to the industry, and made them more fully in touch with the technical aspects of the industry they have to control. In addition, the penal clauses of the Act have always been regarded as ones not to be put into force for every little technical omission, but as the "big stick" kept in reserve for those who, after repeated warnings, would not make a proper effort to comply with the regulations.

If the provisions of the present Gas Regulation Bill pass into an Act without substantial modification, it would appear that the administration of the Act under the Board of Trade will be under the control of the Chief Gas Examiner and of the Gas Referees. The functions of the latter are, however, confined mainly to the methods and times for carrying out the particular tests specified in the Act. It would seem that, so far as the spirit of administration of the Act in the general sense is concerned, this will derive its main source from the Chief Gas Examiner; and on his personality will very largely depend the really successful administration of the Act.

It is most earnestly to be hoped that, for the future of the gas industry, whether from the gas undertakings or the consumers' point of view, the Board of Trade will exert great care in the choice of the Chief Examiner, and will select one who will introduce into the administration the same general spirit as that under which the Alkali Act has been carried on. In view of the largely extended work which will have to be done, a large proportion of any such Chief Examiner's time will be fully occupied; but it is much to be desired that he should have sufficient time to engage in research work to assist in the matter, much in the way that the Chief Alkali Inspectors have always done.

The fact that the cost of such research work would, under the provisions of the Bill, fall on the gas undertakings, might perhaps be objected to by a few, though most would probably regard this as a very remunerative expenditure, and none would desire that such research work should be carried out by the Chief Examiner at his own expense and in his own time, as has actually been the case to a material extent in the case of the research work carried out by the various Chief Alkali Inspectors, the benefit of which to the industry has been frequently acknowledged.

TOWN GAS.

By W. B. DAVIDSON, Ph.D., D.Sc.

As a natural result of recent discussions among gas experts regarding the composition and quality of the gas now supplied and to be supplied in the near future by statutory undertakings, one is led to ask the question: "Is there any such thing as 'Bad Gas'?" Are we implicitly to believe the reiterated statement that "one thermal unit is as good as another, regardless of what the mixture is?"

Are we to come to the conclusion that, on those occasions (not infrequently on a Sunday) when, even in our capacity as gas officials, we had to admit there was something the matter with the gas in our houses, it was only the pressure that was insufficient—due perhaps to naphthalene blockage or a heavy draught on the mains? Reflecting on the matter carefully, we remember that on occasions when we knew the pressure was good, no amount of adjustment to the incandescent burners seemed to put them right; and as for flat-flames, they were altogether hopeless. The expert who happened to possess full knowledge of the gas manufacturing process knew quite well that the trouble was due to too large an admixture of "burning-off" gas as we call it, or it might be to a pocket of this low-grade gas which was generally made during the last two or three hours before the retort-house was closed-down on a Sunday morning.

Burner fittings and pressures might be all one could wish for, but still the effect was obviously poor. Obviously, too, without the continuous record from a reliable calorimeter, one could not then discover the weakness in the gas supply, unless one made a special effort to test the gas at those rather awkward times. Jet photometers are useful in indicating luminosity, but do not give one much idea of the alteration in calorific value, while neither calorimeter nor jet photometer can inform us of the proportion of inert gases.

Probably in nine cases out of ten, when the consumer calls the gas bad, it is only the supply that is defective. But we must admit that it is possible for incandescent lighting and even gas-fires to suffer serious reduction in useful effect through an alteration in the composition of the gas supplied.

INERTS AND HIGH AND LOW TEMPERATURE WORK.

In a more acute degree is a reduction in calorific value (or, more strictly speaking, a large accession of inert gases) felt in working gas-fired furnaces at temperatures above a bright-red heat—for example, in melting metals, such as aluminium, brass, nickel, &c. In high-temperature work it is what is called the head of temperature that counts. That is to say, there must be a considerable margin between the melting-point of the metal and the flame temperature of the gas, if speed and certainty of success are of any value at all. One would never think of applying present-day producer gas to furnaces for (say) melting nickel, though in the coming days of cheap oxygen it may be feasible enough. But at present we can safely say that for high-temperature work the difference between a high and a low grade gas is the difference between success and absolute failure.

Even low-grade industrial gases can be so poor as to fail to supply sufficient intensity of heat to furnaces of comparatively low temperature, be the pressure and the quantity of heat units available unlimited. The writer had three or four years' experience in manufacturing producer gas of the semi-water-gas type, and supplying it to a number of different furnaces of the non-recuperative design. Owing to occasional supplies of unsuitable coal (and sometimes the usual lapses in working the producers), the gas at times got as low as 100 B.Th.U. per c.ft.; the percentages of carbon dioxide and nitrogen being then abnormally high. On these occasions, certain furnaces which were required to maintain in the combustion chamber a temperature of at least 800° C. would refuse to respond to the alteration of gas-valves and air and flue dampers. It became impossible for the most skilful fireman to maintain the necessary temperatures. The only thing to do was to make better gas.

Undoubtedly, for incandescent lighting and purposes where a bright-red heat is essential, gas may at times be correctly designated as bad or unsuitable; and no special tests are required to prove this. It can only be through lack of experience that one can honestly assert that one thermal unit must be as good as another. The statement is only justifiable where low temperatures are concerned. Town gas, we take it, ought to be of the greatest possible general utility, and not merely satisfactory for culinary purposes.

LOW-GRADE GAS SCHEME REJECTED.

Ten or eleven years ago the proposition was seriously put forward of erecting in a large Midland town big central producer plants (with ammonia-recovery) for the supply of low-grade gas to the district. The advocate of the scheme suggested that the gas would be quite suitable at any rate for most purposes, and would certainly be very much cheaper per heat unit than town gas. The scheme was rejected after due consideration on account of the unsuitability of the quality, the difficulty of purifying the gas properly, and the very high cost of distribution. Even on a basis of the cost per thermal unit delivered, there did not appear to be a very satisfactory margin of profit when compared with coal gas.

A German Specification and Modern Relaxation.

The scientific side of the whole question is also of great interest. In the year 1909 a conference of gas experts in Germany came to the conclusion that town gas should satisfy the following conditions:

1. A calorific value as uniform as possible—averaging 544 gross, and not falling below 524.
2. Not subject to tests for illuminating power.
3. A percentage of carbon monoxide up to 25 permissible.
4. Absolutely free from sulphuretted hydrogen, but no limit fixed for organic sulphur in the absence of a process for its removal.
5. No restrictions necessary as to the amounts of ammonia, cyanogen, naphthalene, carbon dioxide, oxygen, and nitrogen, or the specific gravity.

One wonders whether the same authorities would have limited the percentage of inerts, had the question of a calorific standard been left open. Probably they would. At any rate, now that the war has effected a drastic and general change in our expectations from services of all kinds, the writer believes any forthcoming standard for town gas in Germany will give much more lattitude than formerly. Even in the first year of the war the average gross calorific value of town gas supplied by the principal gas undertakings of the country was not less than 560; and one undertaking is known where the management made it an offence when a single test fell below 555. This was a severe restriction on the good working of vertical retorts, one of whose chief virtues is the increased efficiency with steaming. Needless to say, there has since been considerable relaxation of this rigorous regime, much to the relief of the gas engineer. But let us see that the pendulum does not swing too far to the other side.

Over-Pulling and Inerts.

Unfortunately, gas undertakings are in the majority which can reduce the calorific value of their gas only by the vicious system of extreme "over-pulling," whereby nitrogen and carbon dioxide can readily be doubled or trebled in volume. While it is necessary to maintain a slight vacuum on the retorts to avoid loss of gas, a very slight vacuum—say, 1-10th inch of water—is all that is required. It is well known, however, to expert carbonizers that the volume of impurities drawn in depends very largely on the condition of the retorts as to soundness.

Effect of Slight Vacuum on Calorific Value and Inerts.

The following tests, carried out by the writer on sound horizontal retorts, will give a good idea of the effect of a slight vacuum upon the calorific value, and percentage of inert gases. [See "Journal," June 21, 1910, p. 842.]

	Pressure in Retorts.	Make. C.Ft. per Ton.	Calorific Value B.Th.U. Net.	Calorific Value. Multiple.	Gas Analysis. Percentages by Volume.		
					CO_2	O	N
I.	Level gauge	12,290	529	6500	2·22	0·73	8·8
	— 0·05 in.	12,940	505	6540	2·67	0·75	11·9
II.	Level gauge	11,130	550	6120	2·13	0·90	7·4
	— 0·20 in.	12,400	500	6210	3·02	1·58	13·2

The gain in heat units in the case of I. is only 0·6 p.ct.; in the case of II., 1·5 p.ct. The respective increases effected in inerts (carbon dioxide and nitrogen) range from 11 to 14·6 and from 9·5 to 16·2 p.ct. It is perhaps hardly necessary to mention that the effect on the candle power was very marked.

Flame Temperature and its Measurement.

Nowadays we probably ought to pay more regard to flame temperature than to illuminating power. If the specific heats of gases at high temperatures were known with some certainty, we should be able to calculate the highest temperature attainable in a flame produced by gas of known composition. Useful comparisons can be made by employing the following figures [Schilling]:

Mean Specific Heat in Calories per Cubic Metre between 0° C. and T°.

T°	Permanent Gases (N, O, CO, H).	H_2O.	CO_2.
100	0·307	0·374	0·397
500	0·318	0·425	0·463
1000	0·331	0·490	0·545
1500	0·345	0·555	0·627
2000	0·358	0·619	0·710

Flame temperature can be measured directly in several ways. Perhaps the most convenient method is by means of a platinum-platinum-rhodium couple. This by itself gives a low figure, due to loss by radiation from the couple. To correct for this, one can use couples of different thicknesses and find by graph the true temperature by extrapolation.

(To be continued.)

Society of British Gas Industries Carbonization Paper.—Those who have not already secured copies of the profusely illustrated paper on "Carbonization" which was presented by the Society of British Gas Industries at the June meeting of the Institution of Gas Engineers, will note from an announcement appearing elsewhere in this issue that these may be obtained from the Secretary of the Society, No. 46, Queen Victoria Street, E.C. 4. The price is 10s. 6d. post free.

GAS IN PRINTING WORKS.

Last December, the Baltimore "Sun" used nearly 2 million c.ft. of gas, which was an increase of close upon 500 p.ct. over the consumption of the same month in 1915. The first large addition to the use of gas was the installation of a burner under an auxiliary 5-ton stereotype pot. Then gas was placed under the 8-ton stereotype pots in the printing works both of the "Sun" and the "News." Air blast, furnished by motor-driven fan blowers, was used to obtain a high and concentrated heat; and the installations have proved most successful. Each pot has six burners sending a jet of air and gas mixed in the proper proportions into a bed of cracked carborundum, which, becoming incandescent, serves as an aid to combustion and a means of securing a large proportion of radiant heat, which is projected against the bottom of the pot directly above the incandescent bed. There is also a small burner for keeping up the temperature when the large burners are not needed, and also for lighting the burners. The matrix tables of the "Sun" are provided with a gas-fired steam-generator under each table; while in the case of the "News" there is a gas-fired boiler in the basement, which supplies steam at 100 lbs. pressure to the tables on the fourth floor. When the "Sun" decided to print their illustrated supplement in their own building, they needed hot water and steam for washing, drying, and heating purposes; and so they fitted up a 12 h.p. high-pressure gas-fired boiler to furnish it. To-day they are using no fuel in their building except gas; steam for heating the building being purchased from a local heating company. The same is true of the "News," except that they are heating the building from their own boilers. A like condition of affairs exists with the plant of the "Baltimore American;" but here the coal-fired stereotype pot is still in use. Under the severe conditions which must obtain in newspaper offices, it is gratifying to find gas proving so successful a fuel.

PETROLEUM RESOURCES OF THE WORLD.

Mr. George O. Smith, Director of the United States Geological Survey, dealing (in a paper before the American Iron and Steel Institute) with the petroleum situation, said that that country, using within its own borders fully one-half of the world's annual production of petroleum, seems to possess only about one-seventh of what remains. He contrasted this with the position of the United States with respect to coal. In the past ten years, their 6000 to 7000 coal mines have contributed 41 p.ct. of the world's output of coal; while present estimates credit them with more than one-half of the world's coal reserves. In the same ten years, their 140,000 to 200,000 oil-wells have poured forth more than 61 p.ct. of the world's output; whereas it is now believed they possess only about 12 p.ct. of the oil left to the world for future use. An estimate of the petroleum resources of the world has, it may be mentioned, just been published by Mr. David White (the Chief Geologist of the United States Geological Survey); and he puts the figure at 60,000 million barrels. As to substitutes for petroleum products, Mr. Smith stated that he had been informed that plants now in operation and under construction have a capacity of 95 million gallons a year, if the output of light oils is converted into motor benzol. This, however, is equivalent to not much more than a week's output of gasoline as the refineries of the United States are now running. The recovery of alcohol from coke-ovens there has not yet begun; but British experience seems to show that the maximum alcohol capacity of the coke-ovens of the United States might be less than their benzol capacity. The oil-shale resources of the country must not be overlooked; but, he says, "even with the largest measure of optimism, backed-up with our oil-shales, we must face the contingency that the next generation of American business men may see their trade rivals across the Atlantic turning the wheels of industry and commerce with cheaper oil than that in the American markets."

A Gas Sales Catechism.—The first text-book published by the British Commercial Gas Association is one that will prove of great benefit both to gas undertakings and their employees. It is true the matter has already appeared in a series of articles printed in the Association's "Bulletin;" but for reference that is, of course, not so convenient as having them in collected form. Anyway, the very fact that a reprint is called for is testimony to the merit of the articles. The book is entitled "A Gas Sales Catechism for the Junior Selling Staff;" and the author is Mr. J. C. Walker, Assistant Secretary to the British Commercial Gas Association. In a preface, Mr. F. W. Goodenough explains that the catechism was originally drafted for juniors as a form of Association assistance to gas managers who were working under peculiar difficulties during war-time, with staffs of partially untrained sales men and women, and says that this fact will explain the apparently elementary character of the series. Well, all of us have been juniors at some time, and many no doubt can still remember how difficult it was to get at the apparently elementary facts about anything. Text-books so frequently have necessarily to assume a previous knowledge which, alas! the student does not invariably possess. Mr. Walker, by beginning at the beginning, offers the budding salesman a sound foundation upon which to build for himself: and many of those for whom the articles were intended must already feel grateful to him.

THE DEMAND FOR COMPULSORY BENZOL PRODUCTION.

By THOS. NEWTON.

THE argument put forward by the various motor organizations for the compulsory production of benzol by gas undertakings contains a fallacy which the gas industry would be well-advised to expose at the earliest opportunity.

In his recent letter to the "JOURNAL" pages, Mr. Robert H. Montgomery incidentally reveals the strength of the movement arrayed against the gas industry on this subject; and he also reiterates that the motor organizations simply want the gas industry "to do its part in helping the whole community." The gas industry probably helps the whole community already to a far greater extent than the motor organizations have any conception of. If it cannot assist the motor organizations to secure cheap and plentiful supplies of motor fuel, it is because it is more concerned to discharge its obligations to the whole community.

Mr. Montgomery admits that to take exception to the action of the motoring organizations in approaching the Board of Trade on the subject of gas scrubbing under the new Act, is a perfectly legitimate attitude for the writer to take up. He, however, states that, when I advocate the stimulation of benzol production in this country, I am speaking in obvious ignorance of what has already been done in this respect. Mr. Montgomery is too premature. He should have finished reading the sentence before giving a recital of the admirable endeavours that the Automobile Association has successfully made to popularize the use of benzol. The omitted portion of the sentence reads: "And with this object in view, sufficient financial inducement should be offered to gas undertakings in order that they may approach it as a commercial proposition."

Admittedly, the Automobile Association has done much to popularize the use, and organize the distribution, of benzol. But that is not the point. The point at issue is whether they have offered, or are now prepared to offer, sufficient financial inducement to gas undertakings in order that the latter may approach the subject of benzol production as a commercial proposition.

THE GAS INDUSTRY'S DUTY TO THE COMMUNITY.

The motor organizations are unduly anxious about the gas industry's duty to the community. If the gas industry had not been so conscientious in this respect, it would probably be in a much better financial position to-day. As a matter of fact, it has served the community to its own detriment. But this is no reason why it should likewise serve the Motoring Associations.

When gas undertakings were called upon to produce benzol to the greatest possible extent, it was during a great national emergency. They produced it, and sold it, regardless of cost; and the whole community reaped the benefit. The circumstances were abnormal; and when the call came, it was tantamount to a S.O.S. from the powers that be. A S.O.S. from Motor Associations is quite another matter. The glut of benzol after the armistice was perfectly understandable; and, of course, great credit is due to the Automobile Association for the campaign they conducted in favour of this home-produced fuel.

THE ECONOMIC SIGNIFICANCE OF THE REDUCED BENZOL PRODUCTION.

The one great mistake, however, which the Automobile Association made was its failure to realize the economic significance of the decline in benzol production. The decline, since the armistice, is about equal to the whole of our petrol imports from America. The chief reason for this decline lay in the fact that benzol production was not considered sufficiently attractive from a financial point of view. In other words, it could only be produced at the expense of gas consumers. It therefore follows that, since gas consumers are the same individuals who constitute by far the greater portion of the community, it would be grossly unfair thus to penalize the community, simply to provide motor users with an excellent motor fuel at an uneconomic price. Instead of appealing to the Board of Trade to insert in the new Bill an amendment making it compulsory on the part of gas undertakings to produce benzol, the motor interests should face elementary economic facts. The argument that they are acting in the interests of the whole community is quite unconvincing.

Unfortunately, Mr. Montgomery has missed the point of the article to which he takes exception. This being so, he has, no doubt unintentionally, confused the issue. The stimulation which the gas industry requires to make benzol production an assured success is not so much facilities for its storage and distribution, as some financial incentive which would really make it worth while to all gas undertakings. Facilities for its storage and distribution, as well as educational propaganda to popularize its use, are both very necessary and very desirable; but the one essential thing is still lacking. It should be understood that gas undertakings are not primarily philanthropic institutions, however much there may be a disposition in some quarters to regard them as such; and they themselves—not an outside body—are the best judges of what is, and what is not, a paying proposition. Gas undertakings should be under no delusions as to the activities of the Motoring Associations in this matter of compulsory benzol production. One wonders what the attitude of these Associations would be if the gas industry endeavoured to obtain parliamentary powers "in the interests of the community" to compel the Associations to provide cheap road transport at uneconomic rates! The incongruity of the situation only needs to be pointed out to be thoroughly appreciated.

BENZOL PRODUCTION A KEY INDUSTRY.

The motoring interests may take it for granted that if benzol production, under present conditions, were considered a commercial proposition, those undertakings that have already abandoned it would not have done so.

There is evidently a desire in some quarters to establish the production of benzol as a key industry. No possible objection can be offered to this, providing the interests of the gas industry are fully protected. The gas industry has nothing to give away just at present; as a matter of fact, it has already given away far too much. The motor-fuel situation is admittedly in a precarious condition—hence it is incumbent on the Motoring Associations to develop new sources of supply. It is therefore suggested that, in the long run, it would be to the interests of all users of motor vehicles if they would combine to offer the much-needed financial inducement in order that the production of benzol might be established as a key industry. The Motoring Associations want benzol; and the gas industry can produce it. But the demand can only be met by treating it as a business proposition. If the price of the product is made attractive to the producers, production will follow, as night follows day. This is really the crux of the position; and when once the Motoring Associations realize it, they will see that the gas industry is neither unjust nor unreasonable in the attitude it has taken up with regard to benzol production.

Heat Transfer by Conduction and Radiation.

In the course of an article on high-temperature furnace work, in the New York "Gas Age," Mr. Edward F. Davis, drawing attention to the importance of preventing heat from being dissipated from the outside of a high-temperature furnace, points out at the same time that, in attempting to obtain perfect insulation, it is quite possible to over-insulate—causing serious damage to the refractories in the high-temperature zones of the furnace. To maintain the inner fire-brick wall, it may be necessary to permit a certain flow of heat through the wall, with a corresponding decrease in the temperature of the refractories at the heated point, in order to prevent their destruction. Generally, the question of insulation does not concern itself so much with the saving in fuel as with the effect produced by confining the heat generated to points of maximum effectiveness. The amount of heat conducted through a unit area from one part of the body to another is proportional to the difference in temperature of the two parts; directly proportional to the thermal conductivity of the body through which the heat passes; and inversely proportional to the distance between the two parts of the body. That is, the conduction of heat through a solid body from one place to another is a direct function of the conductivity of the body and the difference in temperature of the two planes, and an indirect function of their distances apart. The heat transferred from one body to another by radiation is proportional to the difference of the fourth power of the absolute temperature of the bodies. While this is strictly true only of the ideal "black bodies," the variation is so small that, for all practical purposes, this relation holds good in ordinary procedure. The heat inside the furnace is transmitted to the inner face of the fire-brick—first, by radiation direct from the flame; and, secondly, by convection caused by the moving gaseous products of combustion. The heat then travels through the wall by conduction, and is lost from the outer surface by radiation, and also by convection caused by air currents. By far the larger portion of the heat lost through the walls is the result of conduction. In furnace construction, there are two separate and distinct factors which must be considered to produce an effective wall. The first is to provide a material having the ability to resist the action of high temperature, and of sufficient mechanical strength. The second is to prevent the excessive loss of heat due to conduction from the interior of the furnace to the outside, where it is lost by radiation and convection. It is rare that a good refractory material is an insulator; and it is usually necessary to back-up the refractory with some material having a much lower heat-conductivity.

Estate of the gross value of £693 has been left by Mr. Watson Smith, F.C.S., F.I.C., who was formerly Editor of the "Journal of the Society of Chemical Industry," and Professor of Applied Chemistry at University College, London.

The Margam Urban District Council have obtained an Order from the Ministry of Health, under the Statutory Undertakings (Temporary Increase of Charges) Act, authorizing an increase in the maximum price chargeable for gas from 5s. to 6s. 5d. per 1000 c.ft.

Prof. Sir John Cadman, D.Sc., of the University of Birmingham, Mr. W. B. Hardy, Secretary of the Royal Society, Caius College, Cambridge, and Prof. Sydney Young, D.Sc., F.R.S., Trinity College, Dublin, have been appointed members of the Advisory Council to the Committee of the Privy Council for Scientific and Industrial Research.

THE DANGERS OF STRAY EARTH-CURRENTS.

By H. C. Widlake, A.M.I.E.E.,

Of the Plymouth and Stonehouse Gaslight and Coke Company.

In spite of the large and ever-increasing extent to which electrical power is being applied for a whole host of purposes on modern gas undertakings, very little attention appears to have been paid to the dangers of stray earth-currents, and the havoc which such currents (even though their magnitude be comparatively small) are capable of playing with any gas apparatus which may lie in their path. To the author's certain knowledge, serious damage (necessitating costly repairs) has been caused to condensers in this manner; and the mischief has been done and retubing carried-out before any suspicion arose as to the real cause of the rapid deterioration.

In this article it is the intention to deal with the conditions which lead to the setting-up of such currents, and to indicate the manner in which a reasonable degree of care in the installation of gas-works' electrical power-plants and their subsequent maintenance may reduce such risks to a minimum.

The aspect of the phenomena of electrolysis with which the gas engineer will probably be most familiar is to be found in the electro-tinning plants with which so many modern stove-repair shops are equipped. In these plants a number of pure tin-plates are suspended in an electrolytic solution in close proximity to a number of stove tinware fitments which it is desired to replate. The old tins and the pure plates form electrodes between which a low-pressure current of electricity from an outside source is maintained—the current passing through the solution in which the electrodes are immersed.

In the course of the passage of the current, numberless tiny particles of pure tin are detached from the pure plate, and are deposited upon the cleaned surface of the old tinware in the form of a film. The pure tin electrode naturally becomes badly wasted, and from time to time has to be renewed. The analogy between this process and the subject of this article lies in the fact that of the two electrodes between which a current of electricity is purposely passed one of the electrodes is necessarily subjected to a severe wasting action, which in course of time leads to its complete destruction.

Another very familiar example of destructive electrolysis may be found in the wastage to which gas and water pipes laid in close proximity to some of the earlier electric street-car tracks were subjected. Street tramway systems nearly always operate with a track return—namely, the current collected from the overhead trolley wire, after expending its potential in the operation of the street-car motors, returns to its source of generation, via the framing of the car truck, the journals, the wheels, and finally the track itself. Everyone is familiar with the brilliant arcing which is sometimes seen under an electric street-car—a display caused by imperfect contact between the tyres of the wheels and the track, due to accumulations of grit and sand on the rail surface.

The current remains the same in every portion of an electrical circuit; and if we imagine a tramway power station supplying current to one vehicle, it may be taken for granted that the amount of current flowing back through the track to the negative brush of the station dynamo is exactly the same as that flowing in the trolley-wire feeders towards the car. Its potential alone will have altered—falling from (say) 560 volts at the point at which the car collects it from the overhead wires to only a few volts, when it reaches the car wheels, above the pressure of the negative brush of the power station generator. Experience soon proves that the sole and fish plates by means of which the rail joints are made offer very considerable resistance to the flow of the return current, and that preferential alternative routes are taken by the current when it so happens that the joints are in close proximity to gas or water mains.

These conditions are clearly indicated in fig. 1, in which an electric generator is shown supplying current to one vehicle on a distant track. Current flows from the positive pole of the generator A, out along the trolley wire, through the car, and so into the track, the end of which is connected to the negative pole of the dynamo. The track is shown in elevation as is also the car and overhead wire. Poor electrical joints in the track are shown at B, and a gas or water main in close proximity to the track.

The return current, on meeting the first poor joint, will short-circuit the point by taking an alternative circuit into and out from the adjacent pipe-line, as shown by the dotted lines and arrows. This sort of thing may happen at every bad track-joint, or the return current may either wholly or partly use the pipe-line as a return circuit for a considerable length, depending upon the relative conductivity of the track-joints and the pipe-joints respectively. In this latter case the damage will not be universal through the length of pipe so used, but will be confined to the points at which the current enters and leaves the pipe, and also at the joints in the pipe where a certain amount of electrolytic wasting will take place. With a poor tram-track running adjacent to a pipe line (as shown in the engraving), a constant flow and return of current will be taking place along the entire distance over which the track and the pipe-line lie side by side.

The diagram illustrates this point in an elementary manner; but it will not take much imagination to elaborate this simple case and to apply its lesson to known vicinities where tram-tracks and buried pipe-lines lie side by side or cross each other.

It will, of course, be understood that stringent Board of Trade regulations to-day compel a very elaborate system of rail electrical bonding and cross-bonding, with a view to the complete protection of pipe-lines. It is, however, an undeniable fact that the vibration to which the track is subjected together with variations in temperature adversely effect the conductivity of the best bonded joints, and absolute protection is hard to guarantee.

In many cases it has been noted that the commencement of rapid wasting of the mains was coincident with the introduction of a street tramway system, and further that the rate of such corrosion increased with the development of the tramway system. This latter peculiarity may be accounted for by the fact that the drop of potential across a defective rail-joint varies with the current passing, which is, of course, proportional to the number of cars in use.

At a later portion of this article it will be shown that, although current-carrying rail-tracks are not found in many gas-works, analogous conditions may be set-up on works where telpherage systems are employed, or where stray currents are set-up as the result of faulty workmanship in the works' power system.

Within the precincts of a large works the conditions which may give rise to stray earth-currents may be described as follows: From a more or less centrally situated power-house a number of pairs of feeder lines will radiate in many directions to those portions of the works where there exists a demand for electrical power. At practically every point along the route covered by these lines there will be numerous metallic structures—such as boilers, condensers, washers, scrubbing towers, purifiers, holders, &c.—all of which will be in metallic connection and inter-connection the one with the other by a network of gas, tar, and water mains. These structures will all be capable of furnishing ready paths for stray earth-currents, due to the fact that their electrical conductivity will be much higher than that of the surrounding soil. In such localities any stray currents which may arise from a fault or faults in an electrical feeder network will naturally take the line of least resistance towards their destination, and will either wholly or partially travel through the apparatus which happens to be nearest those points in the system at which the faults occur.

A Double-Pole Network.

In order to examine closely the conditions which lead to the setting-up of earth currents, let us take the case of a works supplied with power from its own generating station on a D.C. double-pole system at 220 volts. On many such plants there is a marked absence of expert supervision; local electricians only being called in when some unit of the electrical plant absolutely refuses to work. It will be shown that, under such conditions, the site of the works may be simply creeping with stray earth-currents without the actual working of the plant being in the least affected.

In anticipation of very natural criticism, it may be mentioned that on a plant left to the tender mercies of the "handy man," the greater portion of its time the earth lamps (even if they are ever installed) are usually the first things to be allowed to fall into a state of disrepair, owing to the fact that their function is not understood.

Fig. 2 shows a works' site upon which the general disposition of the various units of gas manufacturing plant may be left to the imagination of the reader. From a generating station, A, pairs of feeder-lines are run in various directions, to serve the points at which motive power is required. Positive mains are shown in light, and negative mains in heavy lines. The system is an insulated one throughout; the difference of potential between each dynamo terminal and earth being 110 volts. Let it be supposed

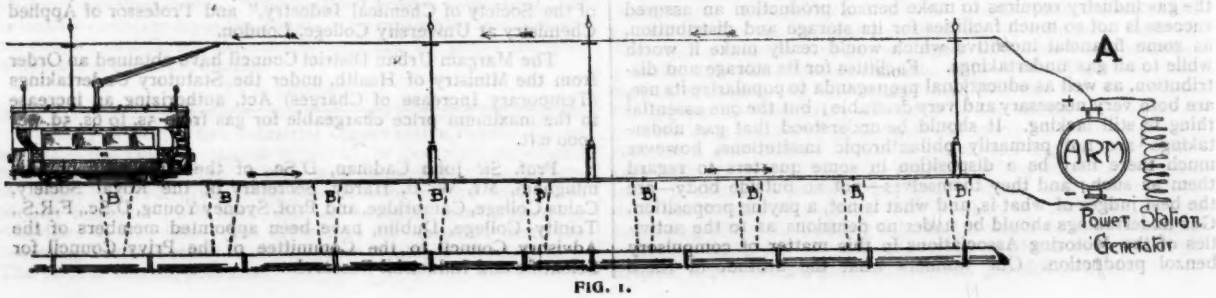


FIG. 1.

that a fault to earth suddenly develops on one of the negative feeders at a point marked *a*. The immediate effect of such a fault will be to put this pole of the system at earth potential, and to double the pressure between all dynamo and motor windings and the frames of the respective machines. The actual running of the plant, however, will probably be totally unaffected—providing that the insulation throughout is otherwise in fair condition; and in the absence of properly maintained earth lights, or other form of ground detector, no one would be aware that such a change of conditions had occurred. It has been argued that the sudden doubling of the pressure between the frames of the various machines and their windings must result in weak places being found out, and a consequent batch of faults coming on the system. It may happen; but it is the author's experience that such a result cannot be relied upon owing to the high insulating qualities of the materials employed in the manufacture of up-to-date electrical apparatus.

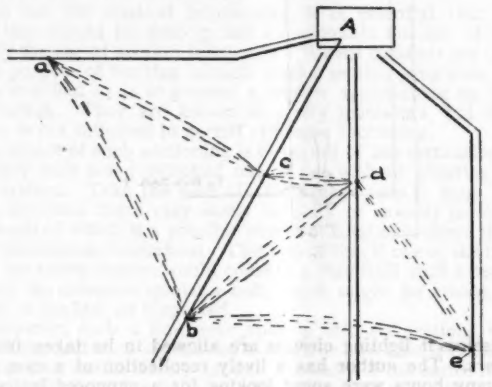


Fig. 2.

No stray earth-currents could be set-up by the occurrence of this one fault, because the insulation of the system at all other points being intact, there would be no two points between which a difference of potential could exist and a flow of current consequently take place. Now let it be supposed that a number of other faults to earth occur on the same side of the system at the points marked *b*, *c*, *d*, and *e* in fig. 2. With five or fifty such faults to earth on the same pole, the running of the system will be in no way impaired, and things will go on just as smoothly as when the insulation of the entire system was intact. But under these conditions a perfect network of stray currents will be set up between the points *a*, *b*, *c*, *d*, and *e*—via the soil to some extent, but mainly through the gas apparatus and mains, which it is reasonable to suppose would be adjacent to these five faults.

It is only when a fault, or faults, occurs on the other side of the system that the blowing of a fuse or the falling of a circuit-breaker calls attention to the fact that something is wrong; and even then it is no unusual thing for a local electrician to locate and rectify the fault without it occurring to him that a fault, or faults, must be in existence on the other side of the system. The only way in which a system can be kept clear of this sort of trouble is by proper attention to the earth lamps or other form of ground detector, supplemented by periodical insulation tests with a good megger.

SINGLE-POLE SYSTEMS.

In most factories running their own D.C. power-plant, the two-wire system with both poles insulated is generally adopted, and comparatively little use is made of single-pole systems. For working pressures up to 220 volts the choice is optional, and in proper hands it may be remarked that either system is equally safe. It has been shown that a "ground" fault developing on one pole of a totally insulated system will have the immediate result of doubling the potential between the windings and frame of every piece of electrical apparatus on the works; and this alone constitutes, in the writer's opinion, a strong argument in favour of the employment of a single-pole system in which the negative side is uninterrupted throughout, and is maintained at a harmless potential by means of a ground or earthing plate permanently connected to the negative bus-bar. In this manner the entire negative side of the system is permanently earthed, and no interruptive device of any kind is permissible between the negative bus-bar and the earthing plate.

Maximum pressure is always maintained between the machine windings and their frames, and no accidental fault can increase the pressure. In the event of a positive fault to earth coming on, the faulty feeder is immediately isolated by its protective devices; and no companion fault on the negative side is necessary to induce the proper action of such devices.

TELPHERS.

The introduction of a telpherage—particularly if the system is an extensive one—has a great bearing upon the question of earth-currents on a gas-works, where moist atmosphere and destructive fumes are a great menace to the maintenance of good insulation of the wires from which the telpher machines derive their supply. It is preferable to keep at a minimum the number of insulators used in connection with these bare wires; and for this reason and also for reasons of economy, telpher manufacturers prefer to supply single-pole installations and use the running rail as the return path to the generating station, in exactly the same way as the street tramways systems use their tracks for this purpose.

The introduction of such a plant on a double-pole system is usually the herald of a bad batch of faults, as well as the aggravation of trouble due to stray currents, inasmuch as the entire telpher track must be regarded as a huge earth-plate by which the negative bus-bar is grounded.

A BAD CASE OF ELECTROLYTIC DAMAGE.

In one case falling within the writer's experience, a single-pole telpher track was introduced on a works served by its own double-pole electrical system, and was actually supplied with current through a double-pole linked switch and fuses on each pole, in exactly the same manner as the other works' circuits were supplied. At the end of every run the telpher circuit was carefully switched-out at the main distribution board, and was switched-in again when the services of the machine were required. In this way the negative side of the system was alternately connected to and disconnected from earth several times a day; and this frequent monkeying with the pressures between the windings and the frames of the various machines soon brought about a nice batch of faults which were duly rectified but never accounted for satisfactorily.

This, however, was only a minor part of the consequences. As has already been stated, the connection between the telpher track and the negative bus-bar was fused, and one day the fuse blew. The telpher went on working, in spite of the blown fuse; and the latter was never replaced—no one troubling as to how the return current found its way back to the negative bus-bar. About six months after this, the plant was taken over by a man who happened to know his business; the blown fuse was noticed; and the telpher track was at once permanently connected to the negative bus-bar, and the double-pole switch gear on this particular circuit was scrapped. A little exploration located a negative fault to earth on one of the continuously used works' feeder cables close to the power-house; and it became obvious that the return telpher current had been finding its way back, via this fault, the soil, and any metallic structure that lay between the fault and the feet of the track. Unfortunately, this metallic structure happened to be the coal-gas condensers, which eventually had to be retubed throughout (seven years before the time); their pipes being completely wasted by the electrolytic action set-up by the passage of the currents.

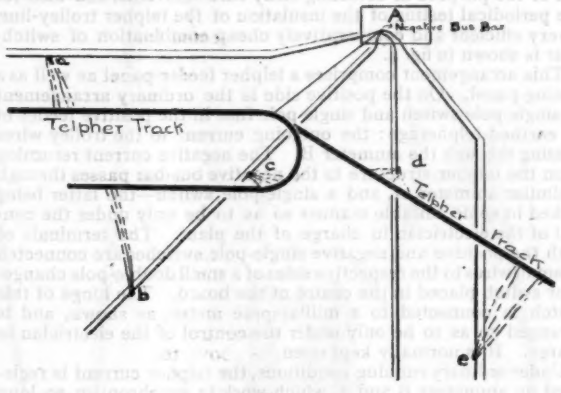


Fig. 3.

Fig. 3 has been prepared on exactly similar lines to fig. 2, with the exception that an extensive telpherage system is shown, the track of which serves as the return circuit for the power taken by the telpher motors. Regarding this track as a huge earthing plate, or even as a continuation of the negative bus-bar, the dotted lines show how, in the event of negative faults occurring on other feeders at the points marked (as before) *a*, *b*, *c*, *d*, *e*, the resultant earth-currents will be largely attracted towards the telpher track, which offers the lowest resistance path back to the negative bus-bar. Here, again, any gas apparatus which may lie between the fault, or faults, and the telpher track will be severely damaged by the passage of current which will set-up destructive electrolytic action.

The following hints will be found of great assistance in the prevention of stray earth-currents on works using telphers:

(A) Proper electrical bonding of the telpher track rails should be insisted upon.

(B) Proper cross-bonding of the track at those portions where track-switches are installed should be insisted upon, as at such points the section of the track is necessarily broken, and a high-resistance joint formed.

(C) So far as is possible let the track legs form the routes for the other works' feeder lines. In the event of it being necessary to use other and remote main routes, do not attach aerial wire brackets to iron or steel structures, but build them into the walls of stone buildings.

(D) Where aerial lines have to be supported from steel or iron

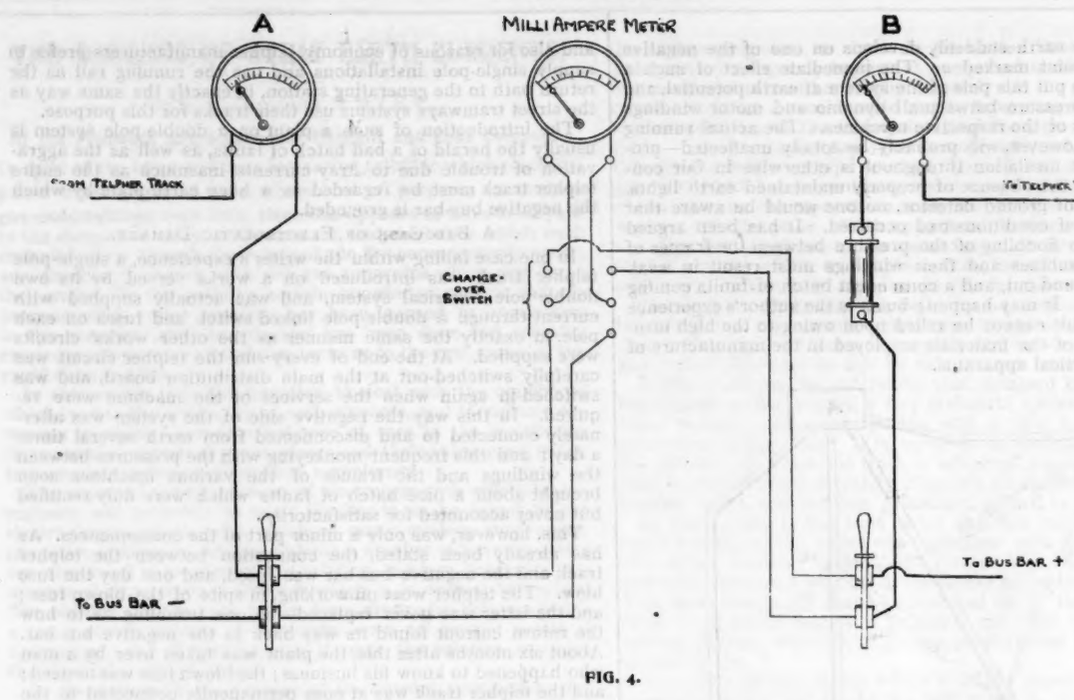


FIG. 4.

structures other than the telpher trackwork, use well creosoted timber brackets.

(E) Where independent telpherage systems are in use, let their trackwork be electrically connected by cable of substantial section.

(F) Let the telpherage system or systems be regarded as one large earth-plate, and institute a proper system of periodical tests to ensure that the electrical system is not grounded at any other point or points.

For the purpose of detecting stray earth-currents, and also for the periodical testing of the insulation of the telpher trolley-line, a very efficient and comparatively cheap combination of switchgear is shown in fig. 4.

This arrangement comprises a telpher feeder-panel as well as a testing-panel. On the positive side is the ordinary arrangement of single-pole switch and single-pole fuse in the positive feeder of an earthed telpherage; the outgoing current to the trolley wires passing through the ammeter B. The negative current returning from the telpher structure to the negative bus-bar passes through a similar ammeter, A, and a single-pole switch—the latter being locked in some suitable manner so as to be only under the control of the electrician in charge of the plant. The terminals of both the positive and negative single-pole switches are connected by small wires to the respective sides of a small double-pole change-over switch placed in the centre of the board. The hinge of this switch is connected to a milliampere meter, as shown, and is arranged so as to be only under the control of the electrician in charge. It is normally kept open.

Under ordinary running conditions, the telpher current is registered on ammeters B and A, which work in synchronism so long as no other currents are improperly returning via the telpher structure. If this should happen, a reading will be shown on ammeter A when its companion is at zero; and even when the telphers are taking current a lack of synchronism will be noticed in the working of the ammeters. In this manner stray currents of any magnitude will be at once detected.

At regular periods (say once a day) the trolley arms of the telphers may be removed from the trolley wire, and the change-over switch thrown to the top position. If no reading can be detected on ammeter B, the positive main switch may be opened, and the milliampere meter put in series with the positive feeder. It will then indicate the current passing into the trolley wire, which, under the above-mentioned conditions can be only leakage current. By this means faulty insulators can be detected in an incipient stage and before they lead to a stoppage.

The leakage current having been ascertained, the change-over switch may be thrown to the bottom contacts, and the negative single-pole switch opened. This will place the milliampere meter in series between the telpher and the negative bus-bar, and it will indicate any current which may be returning via the telpher structure from some other fault on the mains' network.

With this arrangement, currents of any magnitude—whether positive leakage or return—may be seen on the main ammeters. But when this current is so small as to be unreadable on the main ammeters, the milliampere meter may be thrown on to either side of the system and a close reading taken.

It is important that if the telpher system is to be kept under proper control, a special feeder should be run for the sole purpose of feeding the telpher trolley lines, and no other load permitted to be taken therefrom. For instance, the above method of testing will be useless if lighting circuits are allowed to be taken from the feeders. The author has a lively recollection of a case in which many hours were spent looking for a supposed leakage current, which happened to be due to a lamp that had been connected to a telpher positive feeder unknown to the electrician in charge.

The author has developed a rather neat device for discriminating between legitimate return currents for telphers and stray earth-currents which have been picked up by the telpher track from a fault or faults on other portions of the works' distribution network. It is illustrated in fig. 5; and its action will be understood from the following description.

In both the positive feeder to the telpher collector trolley wires and the return lead which connects the track to the negative bus a series-wound coil is installed, and operates a clapper-switch.

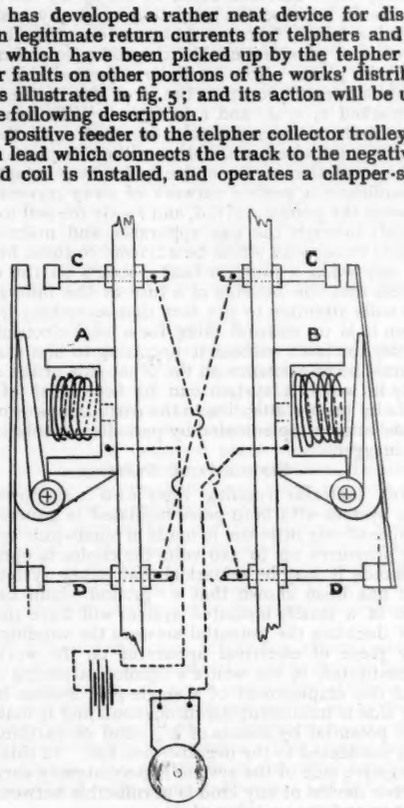


Fig. 5.

These two clapper-switches are marked A and B. The hinge of each switch carries a pair of contacts which make connection with studs fitted above and below the clapper-switches—marked C, C, and D, D. When the clapper-switches are closed, contact is made with the top studs, and when they are open contact is made on the bottom studs. These studs are interconnected (as shown by the dotted lines) and the hinges themselves are connected via the frame of the switch with an alarm circuit comprising a bell, a buzzer, or a red lamp.

When both clapper-switches are closed, no circuit is established; when they are both open, no circuit is established. The alarm circuit is only completed when one switch is opened and

the other one closed. The current in every part of a circuit being the same, it follows that when the current in the operating coil of the negative clapper-switch is that which is being taken by the telpher on the positive pole, via the positive clapper-switch, both the clappers will open and close in synchronism, and will continue so to operate as long as the only current returning to the negative bus-bar is that supplied to the telpher trolley lines.

In the event of any current returning via the telpher track from a fault on some other part of the system, it is obvious that the negative clapper-switch will remain closed or will operate at a time when no current is being taken on the positive pole, and so give an alarm. If the telpher does not happen to be working, the negative clapper-switch will simply close when such a fault comes on and will complete the alarm circuit. If the telpher is working at the time the fault comes on, the clappers will soon fall out of synchronism, and the alarm will be sounded intermittently.

SECTIONING.

In all but the smallest telpherages, it is essential that the trolley line should be split-up into a reasonable number of sections by the use of section insulators. Where turnouts are used for the purpose of working branch tracks, section insulators are always installed so as to prevent a telpher approaching an open track switch. They are known as safety insulators, but their number is not sufficient to permit of proper sectioning.

The object of such sectioning is to permit of any certain length of trolley wire being switched out of use without affecting the entire system. Take the case of a telpherage 1200 ft. long. On such a structure there may easily be sixty or seventy insulator bolts, each of which is a possible source of total shut-down if the line is continuous throughout This means that if one of the bolts failed, the entire system would come to a standstill until a search revealed the defective insulator bolt, which might be among the first six or the last six inspected.

If, however, such a line were split-up into six sections, each 200 ft. long, and each section fed through its own fuse, a defective insulator bolt would merely cut-out one-sixth of the entire track, and would be bound to lie among ten or twelve consecutive bolts in a known section. While the fault was being found, and rectified, the other portions of the track would be in commission, and the interruption would be reduced to a minimum.

In the event of the testing switch-gear already described indicating a large leakage current, the locality of the leakage could be narrowed-down to one-sixth of the whole system, provided the line was properly sectioned. The length of such sections need not be equal but should be determined with regard to local surroundings. For instance, the shortest sections should be arranged in the vicinity of quenching tanks, scrubbing towers, coke silos, &c., and in places where the possibilities of chemical corrosion are known to be greatest. At those points where there are overhead track switches for the purpose of serving branch lines, short sections should be formed, so that the junction can be effectively isolated in the event of a faulty insulator putting a "short" on the system.

The section insulators themselves should be placed so as to render it very unlikely that in the ordinary course of working a telpher machine is liable to come to a stop immediately under the insulated portion, and so lose its current.

THE USE OF MOTOR GENERATORS.

It has been mentioned that one of the advantages of a single-pole telpherage is its comparative immunity from trouble as compared with a double-pole system, owing to the number of insulator bolts being reduced to one-half.

In the event of a single-pole telpherage being installed in a works which is already satisfactorily served by a double-pole system of any size, there is a strong case for the use of motor generators for the working of the telphers. By such means the advantages and simplicity of the single-pole telpherage can be obtained without the necessity of altering the entire system from double-pole to single-pole. If such a system has always given satisfaction, and the works' staff are thoroughly familiar with the working of it, it is far best not to upset its entire characteristics in order to accommodate a single-pole telpherage. In such cases, the use of motor generators provides an easy way out of the difficulty. They may add another £250 to the cost of the job; but in a large plant this is to be preferred to the task of altering the entire plant to single-pole, while the advantages of a single-pole telpherage are well worth purchasing at double the figure.

CONCLUSION.

The author trusts that the foregoing article may be of service to those engineers who have reason to believe that their plant is suffering from the results of abnormal corrosion or wasting, as well as to those who are contemplating the installation of an electrical system of power supply. Trouble of this sort is of a very insidious nature; and its results become well-defined long before any suspicion exists as to the actual cause of the trouble. In many cases the use of electricity on the works marks the commencement of an era of rapid corrosion; and there is a very strong case for the employment of a good electrical consultant as an alternative to leaving the entire details of the new electrical plant in the hands of local contractors. The recommendations which have been given with a view to avoiding such troubles are not costly, and their adoption will insure the entire works plant against happenings which may well cost thousands of pounds to put right.

RECENT ADVANCES IN GAS-BURNER CONSTRUCTION.

By M. PAYET.

[Abstracts of two Papers read before the Congress of the Société Technique du Gaz.]

A LOW-PRESSURE GAS-BURNER FOR USE WITH LARGE PROPORTIONS OF AIR.

The quantities of coal used in France in 1913 for the gas industry and for domestic purposes—5 million and 16 million tons respectively—are cited as an index of the great field for the use of gas which still remains unexploited. Enterprise along this line, M. Payet declared, called for the provision of appliances which should be simpler and better made than those hitherto available, easily adjustable, and, when adjusted, difficult to put out of order. The Société Française d'Incandescence par le Gaz, Système Auer, has applied itself to this question, and has designed a burner (fig. 1) suitable for use at any pressure down to 15 mm. without lighting-back, permitting admixture of a large volume of air with the gas. Emphasis is laid on the latter feature in view of the fact, ascertained by experiments, that in certain circumstances at ordinary pressure the volume of the air may be nine times that of the gas. This favourable result is obtained by the well-balanced design of the burner for the purpose of eliminating eddies and counter-pressure, and of admitting the primary air in a course parallel to that of the gas. In other respects the burner does not differ from any other well designed type.

The adjustment of the air is done by means of a screw-threaded cursor which effects a flattening of the stream of air, thus allowing very accurate adjustment. Perfect combustion of gas of any given quality and at any pressure is obtained by the admission of exactly the requisite volume of air; and this having been done, the cursor can be set in position and the burner maintained in this properly regulated condition.

The method which has been employed for testing this burner depends essentially on the measurement of the density (relatively to air) first of the pure gas and secondly of the gas-air mixture at the burner inlet. This has been done in a series of tests, supplemented, as seen to be necessary, by analyses with the Bunte burette.

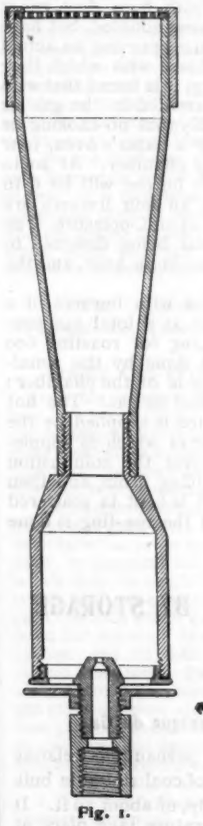


Fig. 1.

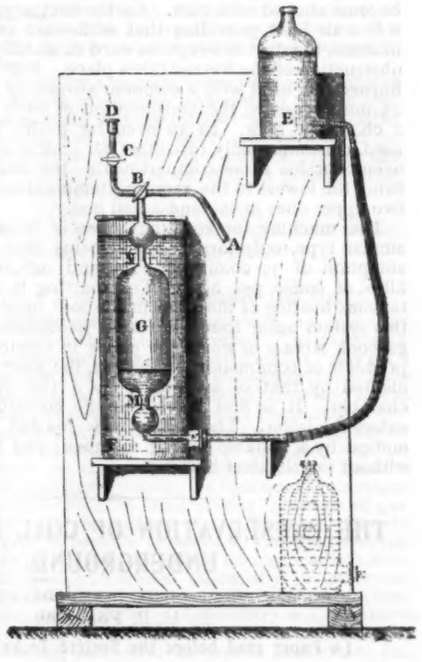


Fig. 2.

The densimeter used for the purpose is shown in fig. 2, from which it will be seen that it embodies means for measuring the speed of flow of the gas to be measured in comparison with that of the same volume of air at constant temperature and pressure. Since the speeds thus obtained are inversely proportional to the square roots of the densities of the respective fluids, the latter are readily determined. In order to minimize error, the speed of flow should be quite small. Then, knowing the density of the gas and of the gas-air mixture at the inlet, the proportion of air

introduced can be calculated. Analytical measurements have proved this method to be of sufficient accuracy for regular use, as shown by the following examples:

Density of gas	0·44
,, ,, a 1 : 2 gas-air mixture	0·82

The gas then contained:

Carbon dioxide	2·7 p.ct.
C_nH_m	2·5 ,,
Oxygen	1·5 ,,

so that a mixture of 1 part of gas to 2 parts of air would contain 14·36 p.ct. of oxygen, a result practically identical with 14·3 p.ct. by the Bunte burette.

In another test the density of the gas was 0·437, and of the mixture 0·907. The mixture was therefore 1 of gas to 5 of air. On analysis, the gas yielded: Carbon dioxide, 2·9 p.ct.; C_nH_m, 2·3 p.ct.; oxygen, 1·2; so that on the basis of a mixture of 1 part of gas to 5 parts of air, the oxygen would be 17·53 p.ct., which compared with 17·30 by the burette.

In calculating the proportion of air in the mixture from the density as found by measurement, it is convenient to use a graph. If the curve be worked-out for a gas of given density, a simple reading then gives the proportion of air in the injector corresponding with the density found for the mixture. A similar graph may be drawn-up for use when employing the analytical method, but the densimetric method is more convenient and sufficiently accurate. A test made of one of an ordinary bunsen laboratory pattern with gas at 50 mm. pressure showed the gas-air ratio to be 1 : 3·3. With the same gas in one of the new burners the ratio at 75 mm. pressure was 1 : 6·1; at 50 mm., 1 : 5·9; at 40 mm., 1 : 5·7; at 30 mm., 1 : 5·5; and at 20 mm., 1 : 5·1.

GAS-BURNERS FOR OVENS USED BY CONFECTIONERS AND OTHERS.

In this paper, M. Payet described the application of the low-pressure burner described above to the heating of ovens for the baking of bread and pastries and the roasting of coffee, &c. Designed for use at such low pressures as 20 and 15 mm., they function at a consumption of 1 to 8 cb.m. per hour. Several burners are attached to a single member in which the mixture of air and gas takes place; the air supply being adjustable so that it can be cut-off for lighting and then admitted in full volume for regular working. Inasmuch as the burners are usually employed in an atmosphere often largely charged with flour dust, gauze covers for the air-inlets have frequently been adopted, but have not been very effective in practice—the gauzes proving an actual cause of derangement, owing to the readiness with which they become choked with dust. On the contrary, it is found that with a free air inlet, providing that eddies are avoided in the gas-air mixture, the dust is swept forward so steadily that no choking or obstruction of the burner takes place. For a baker's oven, four burners are used with a common air-mixing chamber. At 20 to 25 mm. pressure, the consumption of each burner will be 6 to 8 cb.m. per hour. In an oven for pastry all four burners are used, consuming only 1250 litres per hour at 25 mm. pressure. The oven contains three compartments—the heat being designed to bring the lowest to the required temperature in an hour, and the two upper ones in one-and-a-half hours.

The machine for roasting coffee is fitted with burners of a similar type, only larger—seven being used at a total gas consumption of 35 cb.m. per hour, and sufficing for roasting 600 kilos. of coffee per hour. The roasting is done by the simultaneous heating of both the inside and outside of the chamber; this system being found the most economical in gas. The hot gaseous stream in which the coffee is roasted is supplied by the products of combustion of the gas, the heat of which is supplemented by that of air drawn by a fan over the combustion chamber. It is first led round the containing drum, and then enters the latter. The coffee to be roasted is kept in scattered motion by a suitable mixing member; and the roasting is done without the slightest burning.

THE PRESERVATION OF COAL BY STORAGE UNDERGROUND.

By M. R. FORRIÈRES.

[A Paper read before the Société Technique du Gaz.]

This paper deals with the conditions and precautions relating to the outbreak of spontaneous combustion of coal stored in bulk—that is to say, stacked to a height, usually, of about 10 ft. It is common experience that rises of temperature take place at single spots some 4 ft. 6 in. or 6 ft. below the surface of the stack, and most frequently are not detected in their initial stages. The practice of inserting iron rods perpendicularly into the coal to a depth of about 5 ft. is a very imperfect means of indicating the presence of local risings of temperature. Though the projecting ends of the rods be carefully touched by hand each day for signs of warmth, the latter may not be recognized until several days after the trouble has developed 6 or 8 ft. away, and the coal has then to be dug out in order to avoid a fire. Moreover, the absence of internal heating over a period of months or years easily leads to the testing being neglected. The first indication of internal combustion is then the escape of yellowish fumes and the odour of tar. The advice sometimes given, to draw constantly upon stock, at the same time renewing the latter with fresh supplies, is excellent in theory, but involves a double measure of manual labour. It is thus badly adapted to the arrangement of many gas-works. Moreover coal stocks are as a rule formed for winter use, just at the time [midsummer] when accumulations of coke are at their maximum. In many works of old standing, space is not available for storage of both in the best way; and the coal, after some weeks' exposure to the full sun, is liable to take fire.

The two kinds of change which take place in coal on exposure to the air require to be distinguished. One, which proceeds slowly, is exhibited particularly by coals rich in volatile matter. It consists in the loss of occluded gas and of part of the volatile matter. There is, as it were, a distillation of the most volatile products at the ordinary temperature. The other change (relatively much more rapid) occurs with pyritic coals, and arises from the oxidation of the pyrites by the air. Almost every coal contains a small proportion of sulphur readily detectable by analysis. Regularly distributed throughout the coal, its presence is without harmful effect on the storage of the coal; but if the sulphur occurs in the form of minute grains of metallic sulphides (pyrites), the coal is in certain circumstances very liable to become heated by local combustion.

Storage under water, out of contact with the air, is undoubtedly the best means of preserving coal, and one which has been adopted in some places on a large scale. While the elimination of any risk of fire is obvious, it is not to be assumed that the coal suffers no alteration in these conditions. Analyses show a slight loss of calorific power in coal so treated. There is in fact a slow oxidation by oxygen dissolved in the water, and also solution of gases occluded in the coal. The loss may, however, be considered negligible in comparison with the advantages which are secured. Nevertheless the cost of reservoirs and conveying gear, and the necessity of distilling coal in the wet state are considerations which in many works decisively militate against the adoption of the system.

In the year 1912 M. Forrières endeavoured to devise a scheme for the double purpose of increasing stocks of coal and avoiding overheating, several cases of which had led to outbreaks of fire. There were three covered coal-stores. One of these had brick walls on three sides, but was open along one of the short sides. The other two had only two walls at right angles—the roofing being supported by brickwork pillars on the open sides. The first thing which was noticed was that no fire or overheating developed in the first of these stores. On the other hand, every case of incipient fire in the other stores originated not to the rear near the walls, but always near the outside, from 9 ft. to 16 ft. from the open side. The gas coal was about 25 p.ct. of it broken, and the height of the stack, owing to the small floor-space available, was 11 ft. On the occurrence of the first cases of overheating in 1911, the cause was attributed simply to the bad quality of the coal, much of which at the time was obtained from Germany. Since fires originated towards the open front of the store occupied by the latest deliveries, and not in coal further back (which had been in stock for months), this seemed a correct assumption. Afterwards, chiefly in 1912, cases of fire occurred in the coal usually obtained.

The rationale of the heating may be readily set forth as follows: The sulphides (pyrites) oxidize in the presence of air; the process being accompanied by the evolution of heat, and proceeding at a more rapid rate as the temperature rises. Thus if no means exist for cooling the place of the reaction, the heat which is produced constantly intensifies the oxidation of the particles of pyrites, while on the surface atmospheric cooling removes the heat as fast as it is produced. For this reason, cases of heating are never found to occur on the surface of a coal-stack.

But in the case of a deposit of pyrites somewhat within the mass—say, 10 ft. from the edge and 6 ft. below the surface—the conditions may be very different. If the coal is perfectly dry and cold when stacked, and if the prevailing temperature is low, probably nothing will take place. If, however, the temperature is high at the time of the stacking, or the coal is subsequently exposed to summer heat, oxidation of the pyrites will begin and continue by reaction with the small quantity of surrounding air. The process, though on a small scale, is sufficient to heat the confined air, which rises and creates a current in the mass of the coal. Little by little the temperature of the nucleus rises—the heating spreading to the immediate surroundings; while the warm stream of air tends to start the combustion of other deposits of pyrites. Hence, after a little while the original grains of pyrites may become the centre of a zone of active combustion.

This state of things would probably not come about if the pyrites nucleus were situated further within the stack—say, 25 ft. or 30 ft. from the face, or near to one of the boundary walls. If thus more deeply seated, the conditions approximating to the draught of a furnace could not be realized, the position of the pyrites precluding the formation of a passage for both the entry of outside air and the escape of that warmed by the incipient combustion. It is, therefore, evident that the measures against outbreaks of fire consist in preventing the passage of warm gases to the surface of the stack, and, if possible, in cutting off the access of air on two or three sides.

A means of doing this is, in the first place, to cover the stack with a layer of coke dust or finely sieved coal, to the depth of

3 in. or 4 in., thus stopping the circulation of air upwards from the coal or downwards into it. Full enclosure of the sides of the stack within walls is also of service. In 1912 a fire broke out in a stack, one side of which was walled with pieces of broken retorts, allowing free access of air. If enclosure in this way or by large blocks of coal is practised, it is desirable to have a lining of coke dust or else of fine coal against the wall—particularly the lower part.

Incidentally, it may be mentioned that although stocks of fine coal for furnace heating have sometimes been as great as 300 to 400 tons, stacked to a height of 20 ft., or 25 ft., not the slightest heating has ever been detected in them—no doubt as the result of the obstruction to circulation of air which they present.

In 1912 a large stock of coal was to have been stored according to the system described above; and it was intended to cover a stack of 10 ft. or 14 ft. in height with a layer of coke dust sprinkled with tar, in order to render the covering less subject to wind and rain. Lack of space, however, unfortunately interfered with this project; but a little later the opportunity occurred of making a rectangular excavation about 13 ft. in depth for the accommodation of 212 tons of coal. This stock was covered with fine sieved coal, and the ground levelled by laying clayey soil on top to the depth of about 1 ft. Iron tubes, 30 ft. in length and closed at the end, were arranged perpendicularly, 6 ft. apart, reaching to the bottom of the trench. Soon afterwards a further stack of coal was erected on the spot, so that the combined height of the coal was 24 ft. By means of thermometers lowered in tubes it was found that there was no development of heat in the buried coal, whereas the exposed stack showed rises of temperature especially in summer. The lower coal was to have been taken out in August, 1914—that is after two years' storage; but in that month M. Forrières was mobilized, and in the following October the works were occupied by the Germans. On M. Forrières' return in December, 1918, the works had been almost completely destroyed by the Boches shortly before their retirement; but he found some sealed samples of the interred coal taken on Sept. 25, 1917, on which date, having come to an end of his supplies, the French acting manager had been compelled to have recourse to his hidden reserve. A note made at the time was as follows:

"We opened the reserve of coal; it would be a good plan [on future occasions] to cover the fine coal or simply the coal itself with a 6-in. layer of coke dust, in order to avoid waste of coal by admixture with the soil during removal. The uncovered coal was absolutely normal in appearance; and it would have been impossible to say from a first examination that it had been five years in store. In no part of it were there any signs of heating."

Moreover, the register of manufacture contains the following figures for the daily gas production per furnace at this juncture: 1494, 1490, 1437, 1464, 1501, 1664, 1830, 1845, 1611, 1550, 1882. The last six entries relate to the buried coal. The previous power yields are accounted for by the fact that the Germans allowed only inferior coals to enter the works.

Such comparative analyses as could be made have shown that the coal retained its qualities unimpaired; and it may therefore be taken as being well-established that the system of underground storage is a satisfactory means for the preservation of coal, and is of especial value when space is limited.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Gas and Electricity Compared Thermally.

SIR,—The letter from Sir Dugald Clerk, dated June 25, is incidentally very interesting, as it shows how wide-apart may be the view-point of men both of whom may be given some credit for being able to express their opinions in print.

The extract from my patent specification, No. 111,495 of 1916, to which Sir Dugald Clerk refers, was put in to compare with another process in which the whole of the coke was gasified. The thermal efficiency of "Present Gas-Works Practice: Carbonizing Coal—Coke-Making," given as an example, shows 56 p.ct. efficiency. The proposed gas-making process which follows it in the specification, and with which it was compared, is not referred to by Sir Dugald Clerk. This is headed "Gasifying Coal—Gas-Making," and claims 83 p.ct. efficiency.

I was comparing a process of partial gasification of coal (which I designated "Coke-Making") with a process of complete gasification of coal. Further, the figures of working, showing how the efficiencies are calculated, are given in detail. Surely, such a comparison is legitimate, which is more than can be said for Sir Dugald Clerk's.

In his case, to arrive at the figure of efficiency given for the process of gas-making, of 100 parts of coal (80 p.ct. carbon), only 50 parts are gasified, as roundly 50 parts of carbon in the form of coke are left over, and allowed for at 100 p.ct. efficiency. On the other hand, to arrive at the figure of efficiency given for the process of electricity generating, the whole of the 100 parts of the original coal is consumed (gasified). The two efficiencies that are arrived at in this way obviously cannot be compared.

Gas people may make what comparison they please between one process they use and another they propose to use. But when someone, in the name of the gas industry, makes a comparison of the so-called thermal efficiency of a gas process with the so-called thermal efficiency of a process in another industry (such as electricity), it behoves him to look to his "p's" and "q's," so that no conclusions are drawn to the detriment of that other industry unless fully substantiated. We were all taught in our early school days that like can only be compared with like.

In my view, the comparison between gas and electricity given by Sir Dugald Clerk in figures of thermal efficiencies in his combination report with Professors Smithells and Cobb is not only misleading, but entirely without foundation of fact. If Sir Dugald Clerk can show by the production of working results that I am wrong in this opinion, he will find me not only willing but anxious to be corrected. I am taking the efficiencies concerned broadly; and I am not quibbling about a per cent. or two in any of them.

GEORGE HELPS.

Nuneaton, June 28, 1920.

P.S.—I am pleased to notice that Sir Dugald Clerk is not restrained from using the word courteous, and also that he has at last had time to see that the proposed process to which reference is made in the combined report of Professors Smithells and Cobb and himself, in 1918, was mentioned in my patent specification of 1916.

Motor Users and Benzol Production.

SIR,—With regard to Mr. Fottrell's letter to you on the subject of gas scrubbing, two points arise: First, the economic question, which he emphasizes; secondly, the national point of view. Mr. Fottrell states that calculations have been made showing that gas scrubbing may conceivably increase the price of gas 1d. per 1000 c.ft. He neglects to state that calculations have also been made showing that gas scrubbing, especially under the new scheme of selling the gas on the heat-unit basis, is one which is in every way commercially desirable, both from the point of view of the consumer and the gas companies. Certainly, at the present price of benzol, or anything approaching it, suggestions to the contrary evoke smiling comments from those who know.

From the national point of view, however, I certainly maintain that the gas community should scrub for benzol, whether it is commercially profitable or not. In the past war, owing to the allies which we had on our side, we did manage, in the face of almost inconceivable difficulties, to keep up our supplies of benzol for explosives, and our fuel for transport. When the next war comes, we do not know who our allies will be; but it is certainly very unlikely that we can ever be so favourably situated in the future as we were in the past in this respect. Entirely apart from the question of explosives, fuel for transport—and to-day transport is a most important problem with which modern armies have to deal—will be on an entirely different footing. This country must be a very large producer of motor fuel if we are not to be strangled right at the very outset. Our only hope is to utilize such as is available in our greatest natural resource—coal. I maintain, therefore, as stated above, that whether it is a commercial proposition economically or not, the carbonization of coal and the scrubbing of the resultant gases should be an essential point in our national policy. All coal consumed in this country should be previously gasified and the bye-products recovered. If this entails a rise in the price of gas, the community must face it—not because we, the Automobile Association and Motor Union, want cheap fuel, for we never expect to get that from the gas industry, but because a large production is essential to the safety of Great Britain.

I, for one, however, do not for a moment believe that gas scrubbing on a large scale would impose any burden whatever on the gas consumer. It is largely a question of organization; and if the smaller companies clubbed together and put up benzol refining and tar distillation plants at convenient centres, both they and the country as a whole must reap full benefits from the products at present either wasted or disposed of to less advantage.

ROBERT H. MONTGOMERY,
Fuel Department, Automobile Association and Motor Union.

Fanum House, Whitcomb Street, W.C. 2, July 5, 1920.

Proper Use of Gas Appliances—Educate the Users.

SIR,—My vocation as a general medical practitioner has taken me into very many homes during the last thirty years. The experience gained therein has led me to conclude that the "JOURNAL" has yet a great task before it—to insist on a campaign of enlightenment to educate cooks and housewives alike, as well as the public generally, in the scientific management of gas-stoves and cookers for domestic use.

The British Commercial Gas Association have done, and are doubtless doing, good work by advertising the uses of coal gas; but they have failed as yet to send out emissaries to enter into every home to show, by practical demonstrations therein, the fundamental principles which must be employed in order to bring cooking by means of gas-stoves and gas-cookers into the position of a "fine art." Only by such methods will it ever be possible to keep very many kitchens free from bad odours. My plea is that the British Commercial Gas Association, and all other bodies interested (financially or otherwise) should press forward a campaign of enlightenment by the employment of men, competent from their knowledge of chemistry as applicable to gas cooking—men who know the essentials of complete combustion of coal gas, the bunsen burner, ventilation, antiseptics, deodorizers, &c., to give practical demonstrations to cooks and housewives within their homes. The results of such a campaign would doubtless be:

1. More healthy atmospheric conditions for many domestic workers.
2. The atmospheric condition of dwelling-houses would be immensely improved.
3. There would be a greatly increased consumption of coal gas for cooking and heating purposes; and, lastly, even the gas-stoves and gas-cookers presently installed would come "to their own." They would not be used as receptacles for things considered unsightly even in a kitchen; they would doubtless be used for cooking purposes. To think that thousands of gas-stoves and gas-cookers have been fitted into the dwellings of England, and to know that one-half almost of those fitted are seldom or never used, is enough to tone any Englishman down to pity for England, and surely enough to make the gas department of any municipal corporation a non-paying one.

AN ENGLISHMAN BORN IN SCOTLAND.

June 26, 1920.

REGISTER OF PATENTS.

Manufacture of Ammonium Sulphate.—No. 144,030.

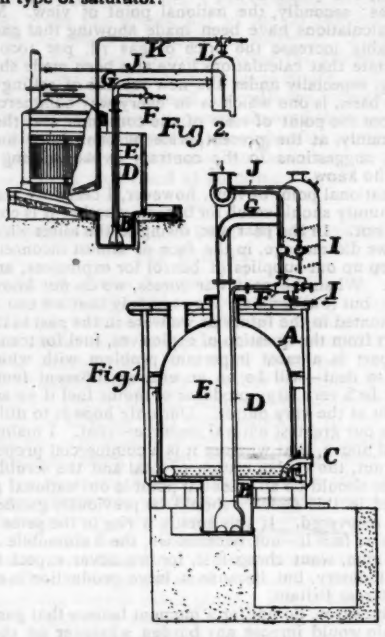
SHADBOLT, S. M., of Lea, and GRAINGER, J. E., of Rainham, Essex.

No. 9784; April 16, 1919.

The patentees remark that, to ensure that sulphate of ammonia shall be freed from all free acid, it is at present usual to treat the crystals from the saturator after centrifuging with an alkaline mother-liquor, or in any other suitable fashion; and, as a rule, with the apparatus now in use the crystals are lifted by a steam or other fluid pressure discharger together with a proportion of the mother-liquor from the liquor pit. Advantage is taken of this step by the patentees to neutralize any free acid, so that subsequent treatment is unnecessary.

To this end, instead of using steam in the steam discharger, ammonia vapours are employed—either alone or mixed with steam. They may be taken from the gas-main leading to the saturator, and may be supplied either by a compressor or an injector.

Fig. 1 shows the invention applied to a closed saturator, and fig. 2 upon an open type of saturator.



Shadbolt and Grainger's Sulphate Plant.

In fig. 1, the saturator A is so arranged with its liquor pit or well B, that the mother-liquor from the separator is returned to the saturator through a pipe C in the usual way. Crystals are lifted from the pit by a discharger, of which D would be the steam-pipe and E the crystal and liquor delivery pipe. There is supplied through the pipe D, instead of (or in addition to) steam, a proportion of ammonia, admitted to the injector F through a connection G with the ammonia main. In the construction shown, F is a steam injector, replacing the usual steam-valve, having a steam supply H. But, alternatively, ammonia could be supplied under pressure from other sources.

The delivery pipe E is not carried direct to the receiving tray and separator, but discharges into a neutralizing chamber and blow-bottle I, in which are arranged baffles, over which the mixed mother-liquor and crystals slowly drip. A second connection J from the ammonia main leads to the bottom of the blow-bottle, and gas is admitted through it to bubble-up through the mother-liquor and crystals and pass over their surface upon the baffles, so as to effect complete neutralization. Any excess gas may be drawn off from the top of the blow-bottle by an injector through a connection to the saturator, in the manner shown at K and L in fig. 2.

Retorts for the Distillation of Carbonaceous Materials.

No. 144,051.

WEST, J., of Southport, WILD, W., of Blackpool, and WEST'S GAS IMPROVEMENT COMPANY, LTD., of Manchester.

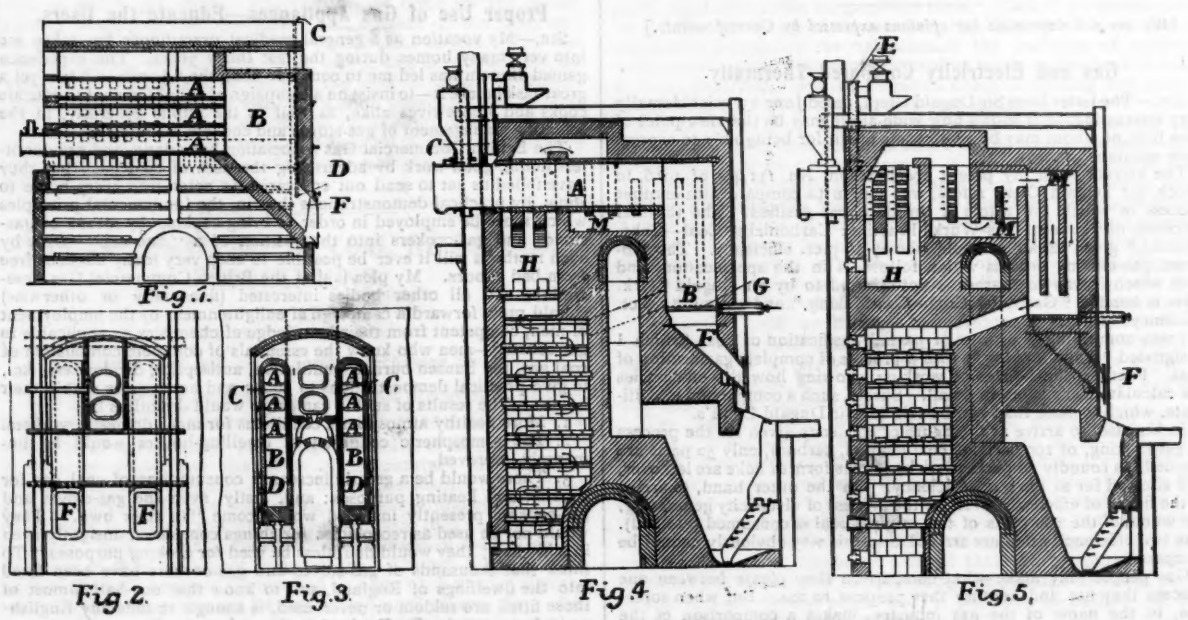
No. 11,413; May 7, 1919.

This invention (relating to horizontal or inclined retorts) is intended to "provide an improved arrangement of retort which shall have high efficiency, and give high gas-yields, whether worked according to the continuous or the intermittent method." The gas off-take, adjacent to its inlet end, has a vertical externally heated chamber at its delivery end, into which the coke is discharged, either continuously or intermittently, after its carbonization is completed, and in which the coke is retained at a high temperature for a sufficient period to be utilized for the production of water gas (which passes through the retort) from steam injected into the chamber.

Fig. 1 [below] is a sectional side-elevation, fig. 2 an end-elevation, and fig. 3 a sectional end-elevation of the setting. Figs. 4 and 5 are sectional side elevations through a retort and to one side of it, showing the heating arrangements.

The retorts A are provided at their delivery end with a vertical coke-chamber B of refractory material and externally heated. Steam is passed through a conduit C in the chamber wall (where it becomes highly superheated) into the interior of the coke-chamber at D, where it is converted into water gas and travels to and through the retort, where it mixes with, and serves to carry off, the gases and vapours generated during the distillation process. The gas off-take is shown at E. At the bottom of the coke-chamber is a coke-discharge shoot F with its valve or closure piece. There is also an intercepting closure piece G for the coke if working continuously. If the retort be charged and discharged intermittently, it is arranged that, first, the coke from the chamber B is withdrawn; and thus the coke in the horizontal portion of the retort is discharged into the vertical coke-chamber. Finally the horizontal portion is re-charged. A small portion of the coke may be left at the delivery end of the horizontal portion of the retort to serve as a stop for the new charge. When working continuously, the coke from the chamber B may be withdrawn either continuously or intermittently; and, if desired, the wall of the retort may be arranged to deflect the coke from the horizontal to the vertical portion of the retort, so as to break the coke off into suitable pieces.

The retorts are heated by the products of combustion from the chambers H; the gases passing back and forth across the retorts, and finally down the opposite sides of the coke-chambers B. Suitable divisions, with gaps therein, serve to support the retorts, and to equalize the heating effect of the gases upon the latter. The waste gases pass into the regenerator brickwork, where the heat is utilized for preheating (in adjacent passages) the secondary air required for combustion in the chambers H.



West and Wild's Retort Arrangements.

Recovering Ammonia from Coke-Oven Gases.
No. 136,834.

SOCIÉTÉ INDUSTRIELLE DE PRODUITS CHIMIQUES, of Paris.

No. 31,689; Sept. 27, 1918. Convention date, May 27, 1918.

According to this invention, ammonia is absorbed in a liquor containing sodium bisulphate, so as to obtain a precipitate of a double salt of sodium sulphate and ammonium sulphate (or a salt of about the same composition). The double salt is then heated to between 350° and 600° C., to obtain ammonia gas and bisulphate of sodium which returns into the working cycle.

The invention is illustrated by the following example: 500 kg. of coarsely crushed sodium bisulphate are placed in contact with about 280 kg. of water. The gases to be treated are passed through the mixture, which is then heated to about 70° C. All the ammonia in the gases is absorbed by the sodium bisulphate, which is transformed into the double salt $Na_2SO_4+(NH_4)_2SO_4+4H_2O$. The precipitate obtained is heated to between 350° and 600° C. in a bath in a closed receiver provided with a blow-off pipe.

On first heating the double salt below 100° C., water of crystallization is driven off. By heating to 450° C., for example, about 60 p.ct. of ammonia is evolved, together with traces of ammonium sulphate. The residue is composed of sodium bisulphate mixed with more or less ammonium sulphate and neutral sodium sulphate according to the extent to which the reaction is pushed. The resulting mixture again serves to absorb ammonia from the diluted gases to be treated.

The patentees state that they are aware that sodium bisulphate, solid or in solution, has already been employed to absorb ammonia from gases containing it—ammonia being recovered from the product in any suitable way. They are also aware that ammonium sulphate has been intimately mixed with one or more equivalent of sodium sulphate and the dry mixture heated (with the simultaneous passage of a current of steam), whereby ammonium and sodium bi-sulphate are obtained—this latter product being utilized for the production of sulphuric anhydride or sodium bisulphate. They are also aware of the patent No. 23,889 of 1908, in which, while a process is described in which ammonium bisulphate containing some sodium bisulphate is employed in the recovery of ammonia from gases and the resultant mixture of sulphates decomposed by heating to about 400° C., no mention is made of the production of the double salt—$Na_2SO_4+(NH_4)_2SO_4+4H_2O$—nor is sodium bisulphate alone the primary material employed.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official List" for June 30.]

Nos. 16,646—17,477.

ANDERSON, J.—"Dry gas-meters." No. 16,879.
AUBURTIN, Sir J. E.—"Coke-gas generator. No. 17,050.
BEACHAM, T. E.—"Fluid-meters." No. 17,080.
BOYD, A. J.—See Beacham. No. 17,080.
BRITISH DYE-STUFFS CORPORATION.—"Manufacture of chlorinated derivatives of toluene." No. 17,037.
BRITISH DYE-STUFFS CORPORATION —"Manufacture of benzaldehyde derivatives and triphenyl-methane colouring-matters." No. 17,038.
CLEMO, G. R.—See British Dye-Stuffs Corporation. No. 17,038.
CLIBBENS, D. A.—See British Dye-Stuffs Corporation. No. 17,037.
CONNELL, J. G.—"Self-closing valves for liquids." No. 17,288.
DAVIS, R. H.—"Apparatus for taking samples of gas." No. 17,213.
EISENWERK JAGSTFELD GES.—"Blast heaters and gas coolers for gas-generators." No. 16,938.
FARBENFABRIKEN VORM. F. BAYER & CO.—"Process for treating or purifying gases containing hydrogen sulphide." No. 17,198.
FARBWERKE VORM. MEISTER, LUCIUS, & BRUNING.—"Manufacture of methane." Nos. 16,757, 16,905.
FISCHER, F.—"Distillation of coal." No. 17,174.
FLETCHER, RUSSELL, & CO.—"Hot-plates for gas-stoves." No. 17,104.
FORSHAW, A.—See Fletcher-Russell. No. 17,104.
GREEN, A. G.—See British Dye-Stuffs Corporation. No. 17,037.
HARTELT, A.—"Device for removing ashes from gas-producers." No. 17,462.
HELLER, F.—See Hartelt. No. 17,462.
IRINYI, A.—"Distillation of tar, &c." No. 17,347.
LILIENFELD, J. E.—"Process for electrical gas purification." No. 16,726.
METALLBANK UND METALLURGISCHE GES.—See Lilienfeld. No. 16,726.
METERS, LTD.—"Coin-freed prepayment mechanism." No. 17,450.
NOBLE, A.—"Gas-igniters, &c." No. 16,780.
ROBIN, J. T.—"Treatment of fabrics for gas mantles, &c." No. 16,898.
ROSLING, C.—See Davis. No. 17,213.
SKINNINGROVE IRON COMPANY.—"Electrostatic plant for depositing dust, &c., from gases." No. 16,701.
SMITH, T. R.—See Skinningrove. No. 16,701.
SOC. FRANÇAISE DE TRAVAUX ET CONSTRUCTION DE FOURS, ANCIENNEMENT AUBURTIN ET CIE. See Auburtin. No. 17,050.
YOUNG, E.—See Meters, Ltd. No. 17,450.

It had been proposed that there should be a co-partnership festival at the Crystal Palace this year; but the Board of the South Metropolitan Gas Company were informed that many of the employees considered the expenditure which would be entailed was not justifiable in the present difficult circumstances. The Directors agreed with this opinion, and said that if the Co-Partnership Committee endorsed it they would be prepared to postpone the festival until better times. This they did—the resolution to hold the festival being unanimously rescinded.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

A group of Bills, including the Redcar Urban District Council Gas Bill, has been referred to a Select Committee, who met yesterday, consisting of Lord Oranmore and Browne (Chairman), Earl Craven, Lord Loch, Lord Cawley, and Lord Wavertree.

The Gas Provisional Orders Bill and the Gas and Water Orders Confirmation Bill were read a second time, and committed.

The following Bills received the Royal Assent: Dumbarton Burgh Gas Order Confirmation Bill; Ministry of Health Provisional Orders Bills (Nos. 1 and 2); Maidenhead Gas Bill; Risca Urban District Council Bill; Masham Urban District Council Bill; Wandsworth, Wimbledon, and Epsom District Gas Bill; Rochester, Chatham, and Gillingham Gas Bill.

Gas Regulation Bill.

The Gas Regulation Bill was brought from the Commons, read the first time on June 30, and ordered to be read a second time to-morrow [Thursday].

HOUSE OF COMMONS.

Progress of Bills.

Group H of Opposed Bills, which includes the South Metropolitan Gas Bill, has been referred to a Committee—to sit to-morrow, Thursday—consisting of Sir Park Goff (Chairman), Lieutenant-Commander Williams, Mr. Wignall, and Mr. Gange. The South Metropolitan Gas Bill is first on the list.

The Newtownards Urban District Council Bill was read the third time, and passed, with amendments.

A copy was presented of a draft Order in Council under the Ministry of Health Act, 1919, entitled the Ministry of Health (Transfer of Powers as to Gas Undertakings) Order, 1920. It was ordered to be printed.

A copy was presented of a report on an application by the Aldershot Gas, Water, and District Lighting Company to the Board of Trade under the Public Utility Companies (Capital Issues) Act. Reports have also been presented on applications by the South Suburban Gas Company and the Bexhill Water and Gas Company.

The Brighton and Hove Gas Bill and the Southend-on-Sea Gas Bill were reported, with amendments.

The Ministry of Health Provisional Order Confirmation Bill No. 6, which was sent forward for third reading by the Unopposed Bills Committee last Thursday, included Orders authorizing the Manchester Corporation to borrow an additional £1,000,000 for purposes of their gas undertaking, and the Neath Urban District Council an additional £70,000 for a similar purpose.

The Camberwell Borough Council and others have withdrawn their petition against the South Metropolitan Gas Bill.

The Gas Industry Dispute.

Colonel NEWMAN asked the Minister of Labour whether he had any statement to make as to the negotiations that were believed to have been taking place between himself and employers and employed in the gas industry.

Dr. MACNAMARA said he was glad to state that the notices for the cessation of work had been suspended for a week, and that a meeting between the parties had been arranged.

GAS REGULATION BILL.

The Report Stage and Third Reading in the House of Commons. A First Reading in the Lords.

Last Tuesday the Gas Regulation Bill, as amended by Standing Committee A of the House of Commons—see last week's "JOURNAL," p. 846—was considered by the House and was subsequently read the third time and passed.

Sir FREDERICK BANBURY had given notice to move the following new clause:

Supply to Railway Premises.

(1) Notwithstanding anything in this Act contained all gas supplied to the premises of a railway company shall, except in case of accident or emergency, be supplied at such minimum pressure as will balance a column of water not less than 20-10ths of an inch in height at the inlet of the primary meter or meters registering the supply to the railway company. Provided that if at any time the undertakers shall supply gas of a less calorific value than 500 B.Th.U. gross, such pressure shall be so increased that the product of the multiplication of the number of thermal units by the number of tenths of an inch pressure as so increased shall at no time be less than 10,000.

(2) Any gas examiner appointed under this Act may and shall for the purposes of this section at the inlet of the said meter or meters, at the request of the railway company concerned, test the pressure at which the gas is supplied, and the undertakers shall afford all reasonable facilities for making such test or tests.

(3) Any alteration, adjustment, or replacement of the burners, pipes, and appliances of a railway company that may be necessary in consequence of the declared calorific value differing from the calorific value of the gas as authorized at the date of the Order under this Act, or where an illuminating standard is in force from the calorific equivalent of such illuminating standard, or in consequence of any subsequent alteration in the declared calorific value, may be made by the railway company; and the undertakers shall repay to the railway company the reasonable cost of such alteration, adjustment, or replacement.

He, however, said that Mr. Bridgeman had intimated to him that he was not prepared to accept the new clause, but proposed to move two

amendments which seemed to him (Sir F. Banbury) to meet the case. He would not therefore press the new clause.

Mr. BRIDGEMAN quite realized that certain people, not railway companies alone, but other people as well, had certain obligations and duties in which the public were concerned; and he hoped the amendments he proposed would be satisfactory.

In clause 1—"Power to Substitute a New Basis of Charge"—Mr. ATKEY moved at the end of sub-section 4 to insert a proviso to the effect that the Board of Trade may require the undertakers to construct and work to the satisfaction of the Board suitable plant for the extraction of such bye-products of coal as the Board consider necessary in the public interest; provided that no such requirement shall be made if it appears to the Board that any loss of revenue due to the reduction in the calorific value of the gas owing to such extraction will not be compensated for by the probable net proceeds of the bye-products derived. The amendment was, however, not seconded.

Mr. BRIDGEMAN then introduced one of the amendments to meet his promise to Sir F. Banbury. This was to add to sub-section 2 of clause 2 words to the effect that different mimima may be specified for different parts of an undertaking, or for gas of different calorific values. He also proposed to add:

> Where any undertakers are, at the time when an Order is made with respect to them under this Act, under a statutory obligation to comply with conditions in relation to pressure which are in excess of the provisions as to pressure contained in this section, the Order shall make such provisions as appear necessary to the Board of Trade for preserving these conditions: and this Act shall in its application to those undertakers have effect as though such last-mentioned provisions were substituted for the provisions of this section as to pressure.

He said that the object of this provision was to preserve to companies any statutory rights they had under the Acts to which this mainly refers, and which were in some respects amended by the Bill.

This proposal was agreed to; and, after a few verbal alterations had been made,

Mr. BRIDGEMAN moved to add to clause 5—dealing with the testing of the gas by the duly appointed gas examiner—words to the effect that in cases where the testing-place is situated elsewhere than on the works of the undertakers, reasonable notice shall be given to them of the time at which the examiner will attend for testing. This, he said, was merely for testing the machine to see if it was right. Though he did not think it necessary to give notice where the testing place was on the works, it did seem only right, as the undertakers had the right to be present, that they should have notice when the testing place was elsewhere than on the works.

The amendment was agreed to.

In clause 8—dealing with the penalties to be imposed for failure to comply with the prescriptions of the Gas Referees—it was agreed to alter the text so as to provide that the figures, in the case of a continuing offence, should count for each day "after conviction," rather than from the time the offence was first detected.

In order to meet the case of undertakings which do not have a continuous recording calorimeter, the following words were added to sub-section 1 of clause 9:

> Provided that, where there is no continuous record of the calorific value of the gas supplied by any undertakers, if on any occasion of testing the calorific value at any testing place is found to be more than 5 p.ct. below the declared calorific value, a second testing shall be made on the same day after an interval of not less than one hour, and the mean of the two testings shall be deemed, for the purposes of this sub-section, to be the calorific value of the gas supplied by the undertakers at that testing place for a period of two hours ascertained as aforesaid.

Words were also added to the clause, as follows: "In every case the amount [of penalties imposed] so ascertained shall be shown in the accounts of the undertakers as a separate item until the undertakers have shown to the satisfaction of the Board of Trade that it has been applied to a reduction in the price of gas." This, it was pointed out, was to prevent forfeited money being carried-over from year to year, and eventually possibly finding its way into the hands of the shareholders, and to see that the proper amount went in reduction of the price of gas to the consumer.

Sir RYLAND ADKINS proposed to add words to clause 10—dealing with the right of the Board of Trade to make Special Orders in certain cases—to make it clear that the procedure takes place upon the application of any kind of person who is legitimately interested in such an Order being proceeded with.

Mr. BRIDGEMAN did not believe that the words were necessary; but as they were merely declaratory, and were only doing exactly what the Board would have done in any case, he had no objection to their being put in.

The amendment having been agreed to, the Bill was read the third time, and passed.

The Bill was received by the House of Lords on Wednesday, read the first time, and ordered for second reading to-morrow (Thursday).

BRIGHTON AND HOVE GAS BILL.

Sir EDWIN CORNWALL (Deputy-Chairman of Ways and Means) presided over the Unopposed Bills Committee of the House of Commons last Thursday, when the Bill promoted by the Brighton and Hove General Gas Company was considered.

Mr. SEAGAR BERRY (Messrs. Sherwood and Co., Parliamentary Agents) said the Bill had three main objects. The first was to raise additional capital; and, in this connection, he handed in a statement showing the position. The Company have unexhausted capital powers amounting to £81,341. The new capital proposed by the Bill was £220,000, which was arrived at by taking the new capital at £100,000, one-third borrowing powers £33,333, and increasing the borrowing powers on the unexhausted capital from one-quarter to one-third. The capital expenditure on works now in hand was £130,837. Further extensions anticipated during the next four years amounted to £171,200, and extensions to mains and services £50,000. This made a total of £352,037 capital expenditure between 1921 and 1925, or something more than the capital powers asked for. Of the mains expenditure, £20,000 would be in Brighton, £10,000 in Hove, and £20,000 in an outside area. The reason for this large expenditure on mains was due to housing schemes, and the fact that costs were so much higher than they used to be.

There was no report from any Government Department on these proposals; and the Committee agreed to them.

Mr. SEAGAR BERRY then referred to the other proposals of the Bill. Originally a revision of the price of gas was proposed; but it had been found that the costs had increased to such an extent since the autumn that the proposal did not cover the increased cost. Therefore the clauses relating to this part had been struck out by the promoters, who would deal with the matter under the Government's Bill now before Parliament.

Clauses 25 to 28 referred to voting rights and directors' fees. As to the latter, the Company, unlike most, had their directors' fees limited by statute. Under an Act of 1881, the initial figure was £1500, which was increased in 1910 by £750. Beyond this, the directors were entitled to £200 for every 1 p.ct. the Company could pay as dividend above 5 p.ct.; and he imagined the object was to encourage the directors to keep the cost of gas down, as the price of gas to the consumer decreased with increasing dividends. By agreement with the two local authorities, it was now proposed to take the initial figure of £2250; and instead of the addition based on increased dividends, there should be an increase calculated at the rate of ½d. for each 1000 c.ft. sold—the object being to regulate the fees rather by the amount of business. Under this new system, the figures for last year's output of gas would leave the directors in practically the same position, after paying income-tax, as they were before the war.

Sir ERNEST MOON, K.C. (Speaker's counsel), expressed the view that there should be some limitations of the sum to be paid to the directors calculated at ½d. per 1000 c.ft.—say, £1500 or £2000. Under the Bill, the Company were going to spend as much money as there was now capital in the business, which meant that the output would be very much increased.

Mr. BERRY said he was in the hands of the Committee. It was rather a delicate matter to discuss directors' fees; but the point had been debated with the two Corporations concerned, and they were satisfied.

Sir ERNEST MOON said it was unusual to have the directors' fees based on output. The proposal meant that an indefinite amount could be paid.

Mr. BERRY said that in ordinary circumstances the fees were fixed by a shareholders' meeting.

Sir ERNEST MOON remarked that in this case the Company were asking the Committee to increase the fees.

Mr. BERRY thought there would be no objection to inserting words to the effect that the total amount to be paid should be subject to the approval of a shareholders' meeting.

The Committee agreed; and words to this effect are to be inserted.

Mr. BERRY drew attention to the co-partnership scheme in the Bill, which, he said, contained quite common-form provisions.

Mr. *E. L. Burton* (Secretary to the Company) proved the preamble of the Bill, which was ordered to be reported for third reading.

SOUTHEND GAS BILL.

This Bill was last Thursday before the Unopposed Bills Committee of the House of Commons—Sir EDWIN CORNWALL presiding.

Mr. SEAGAR BERRY (Messrs. Sherwood & Co., Parliamentary Agents) said the Bill first proposed to confirm an agreement to extend the limits of supply in order to take in a small area of the Rochford Gas Company, which adjoined the Southend Company's area. This would be to the advantage of the consumers, because the present price in this area was 7s. 3d., while the price under the agreement would be 5s. 6d., *plus* 1s., or 6s. 6d. per 1000 c ft. The Bill also proposed to remove the existing limit of the dividend on the preference capital—namely 5 p.ct.—and to give the Company power to raise it to not more than 7½ p.ct., except with the approval of the Board of Trade.

The CHAIRMAN pointed out that, though money was dear now, no provision was made for when it got cheaper (say) in a few years' time.

Mr. BERRY said that if the Committee thought 7 p.ct. was a more satisfactory figure he would agree.

The CHAIRMAN thought it would be, seeing that the Company could go to the Board of Trade to increase it.

The limit to which the Company can go, therefore, was fixed at 7 p.ct., with an application to the Board of Trade should it be necessary to go higher.

Mr. BERRY (continuing) said that clause 7 gave power to borrow to the extent of one-half the issued capital, on the lines of the Public Utilities Act just passed.

Sir ERNEST MOON, K.C. (Speaker's Counsel), asked if there was any provision in the Public Act for the existing debenture holders.

Mr. BERRY said there was not. The only case in which the consent of the debenture holders had to be obtained was when the priorities were altered; and it was not proposed to do that in the present case. Power was also taken to issue redeemable stock; and under clause 10 there was an alteration of the standard price. At present, the standard price was 4s. and 4s. 3d.; the reason being that a different standard price was applied by Parliament to new capital granted in 1904 and 1914. In order to bring some of the newer capital more on a level with the older, it was proposed to have a standard price of 5s. 6d., 5s. 3d., and 5s., according to the class of stock. The original standard price was 4s. 3d.; but in respect of the new capital referred to, Parliament said the standard price should be 3d. less. This difference of 3d. was maintained under the proposal in the Bill which had been agreed with the Southend Corporation.

Mr. *J. T. Randall* (Secretary to the Company) proved the preamble of the Bill; and the Committee ordered it to be reported for third reading.

LEGAL INTELLIGENCE.

Condemnation of Mantles of Enemy Origin.

On Wednesday, the 30th ult., the case of *Attorney General v. Sechnisch Bureau van H. Rutgers* came before Mr. Justice Darling; the Crown asking, on eleven informations, for the condemnation of incandescent gas-mantles of the value of £1000 which had been seized by the Customs. Under the Customs (War Powers) Act, 1915, goods coming from an enemy country were liable to seizure. The Attorney General (with him Mr. Giveen) for the Crown, explained that there was a provision in connection with the power of seizure which gave power to H.M. Consular agents to give certificates for importation in cases where the goods contained not more than 25 p.ct. of enemy work and labour. This was in 1915. Subsequently the percentage was reduced to 5 p.ct. Defendants relied on the certificate of origin. The certificates in this case were obtained by falsely and fraudulently representing that the country of origin was not enemy country, and by concealing the fact that the greater part of the work was really of enemy origin. The mantles were imported in November and December, 1915; the defendants being a firm who traded in Holland. In August, 1915, Mr. J. T. Robin, of Streatham, was requested to visit Dutch mantle factories. Among other factories he visited that of the defendants, and found they had nothing in the way of machinery—being entirely dependent upon Germany for supplies. When the mantles were seized, the defendants claimed that the goods did not exceed 25 p.ct. of enemy work; but afterwards they admitted that the rims and fitting of the mantles were of German origin. The boxes in which the mantles were packed were German. The manufacturers' name had been obliterated by a label pasted over it bearing the words "Made in Holland." Evidence was given by Mr. Robin that the goods were clearly of German manufacture, and that there was no factory in Holland capable of turning out such mantles. Mr. Benjamin Bark, the Works Manager of the Welsbach Company, said that some of the mantles were partly German and some were wholly German. After hearing Mr. Bruno Schoeman (the Works Manager of defendants at Schiedam), his Lordship said he found that the mantles were not made in Holland, and gave judgment for the Crown for condemnation on all the informations, with costs.

Disputed Gas Account at Kidderminster.

In connection with a summons for non-payment of a gas account, magistrates sitting at the Kidderminster Police Court decided that the Gas Company must go to the County Court for the recovery of the money, as the six months' limitation had been exceeded. The defendant, Mr. C. E. Harrison, had a meter which proved to be defective; and a new one was installed in May last year. The Company sought to obtain payment of the amount (£3 13s. 6d.) which they said should be due to them for the March quarter—this amount being based upon the consumption for the next quarter. For the defendant, it was urged that the magistrates had no power to make an order, because the demand was more than six months old. But the reply on behalf of the Company was that the point which the magistrates had to decide was the quantity of gas consumed during the quarter under discussion. If they did so, the Company could apply elsewhere for the recovery of the sum. Subsequently, application was again made by the Company to the magistrates to determine the amount of gas consumed; the request being based upon section 20 of the Gas-Works Clauses Act of 1871. What was asked was that the Bench should decide the basis upon which the County Court Judge should order payment to be made. On behalf of the defendant, it was contended that the case had already been determined by the Bench, who could not now go back upon it; and the magistrates thereupon refused to hear the application.

Powers of Charge at Rowley Regis.

The Secretary of Rowley Regis and Blackheath Gas Company (Mr. T. Thornton) has forwarded a long letter to the Board of Trade, replying to objections raised by the Urban Council to an application by the Company for powers to increase the price of gas to 6s. per 1000 c.ft. Objections were raised on the ground of the poor quality of the gas and the existing high price; and the Board of Trade were asked to insert a clause in the Order providing for a review and reduction of the charges as soon as circumstances permitted. Replying to the statement that the quality of gas supplied had at times caused dissatisfaction, Mr. Thornton points out that during the period of the war the Company experienced such an extraordinary demand for gas that the plant had to be worked to its utmost capacity—this demand being made by important munition works. The result of such strain on the plant was that when the war ceased it was found to be in a bad state of repair; and the difficulties referred to were experienced during the time that the repairs were taking place, and the compulsory use of inferior coal. With regard to the alleged dissatisfaction at the price of gas, he pointed out that the charges compared favourably with six of the neighbouring gas undertakings. When it was taken into account that the cost of coal had advanced from pre-war times to the present day by 172 p.ct., labour by 150 p.ct., and other materials anything up to 300 p.ct., while the price of gas had only increased 55 p.ct., the Company thought that the gas consumers had no cause for dissatisfaction as regarded the price, and that the increase was justified. The shareholders had not received any benefit at the expense of the consumers—in fact, they had suffered a loss, as the dividends paid on last year's shares were equal to only one-half of the usual 6 p.ct. and £4 4s. p.ct. dividends. The Directors were quite prepared to accept such conditions being inserted in the Order as would admit of a review and reduction of the charges as soon as circumstances warranted; but they considered this quite unnecessary, as competition with other sources of supply for lighting and power would regulate the charges. The Local Authority, who considered the letter at a meeting last Wednesday, decided to insist on the clause being inserted in the Order.

MISCELLANEOUS NEWS.

GAS STRIKE SETTLED.

Last Wednesday, negotiations were resumed between the employers and the gas workers' negotiating committee on the national claims for 10s. a week increase for gas workers and improved overtime and holiday conditions. Strike notices, affecting about 90,000 workers all over the country, would have expired last Saturday week; but in view of the employers' offer of an increase of 1s. per day or shift to date from June 1, it was agreed to suspend the notices for one week. As a result of Wednesday's conference, which lasted over three hours, the threatened strike was again postponed over the week-end, and there were indications that a settlement would be reached. Overtime and other points in the claim were discussed; and a Press representative was informed by Mr. James O'Grady, M.P. (Secretary of the National Federation of General Workers), that a general conference of delegates from all the unions involved would be held yesterday [Tuesday] to consider the employers' "extended offer."

It was officially announced by the Negotiating Committee that telegrams had been sent to the Executives of the various unions concerned, the members of the workers' side of the Joint Industrial Council for the Gas Industry, and two members of each of the Regional Councils connected with the Council, notifying them of the decision to call a general conference "to consider new circumstances, and instructing the men to remain at work pending the decision of this conference."

[A settlement of the strike was arrived at yesterday; and the terms are given in our editorial columns to-day.]

BRIEF STRIKE OF BRADFORD GAS WORKERS.

Bradford gas workers, at a meeting last Friday night, decided on an unauthorized strike, to operate from 10 p.m. on Saturday, in defiance of the instructions and urgent advice of their union leaders, who urged the men to remain at work, pending the national negotiations then in progress. The decision of the local men was reached by a "snap" vote. Of the 1000 men in the department, 800 belong to the unions concerned in the dispute; but only about 25 p.ct. of the men voted on Friday night, when the result of the vote was 148 for a strike and 75 against. It has to be borne in mind, however, that the majority wanted to strike a couple of weeks ago. The gas workers made no application whatever to the Bradford Corporation; and Mr. Charles Wood (the Engineer) holds that they work under the best conditions of any in the country, and that they receive higher wages than the average. When the decision became known, Bradford had only two days' stock of gas.

In the event, the strike proved to be short-lived. The men ceased work at the hour appointed; but on the Sunday morning, in response to an urgent request from the headquarters of the Gas-Workers' Union, they decided to return to work at once pending the announcement of the result of the national negotiations. This decision was reached at a mass meeting on Sunday. Mr. T. Leary, the Chief Organizer for the district, announced that the instructions of the Executive were that the men should present themselves for work at once, which was received with applause. Mr. C. Glyde, the Local Secretary, appealed to the men to think what the effect of their action would be on the rest of the community if they persisted in the strike. "For the sake," he said, "of the working men of Bradford, who will be thrown out of employment—for the sake of your good name—meet the wishes of the Gas Committee in this matter, and go back to your work." A formal resolution that work be resumed at 10 o'clock that night was carried with only eight dissentients.

Mr. Charles Wood, in an interview with a "Yorkshire Post" representative, welcomed the news that the men had taken up a more conciliatory attitude. He added that when the men ceased work on Saturday night they withdrew the firemen; and even though they resumed duty on the 10 o'clock shift, it would mean that some of the retorts would not be making gas before Monday afternoon. "As far as I can see," he said, "we shall have enough gas for a restricted supply on Monday. There will be no gas available for street lighting during the week; and it may be that we shall have to curtail the general supply after Monday. This, of course, greatly depends upon the condition the retorts."

BIRMINGHAM MEN CONTINUE AT WORK.

A meeting of workers employed at the five stations of the Birmingham Corporation Gas Department had a long discussion, after which the men (who for some time seemed inclined to cease work last week-end) decided to continue at their jobs until the completion of the general negotiations, and afterwards to determine whether or not they should accept the terms arranged. Mr. E. Hallas, M.P., who presided, said those who wanted to "down tools" at any time, merely for the sake of so doing, were not the best trade unionists. They were out to get the best possible terms for their members; and if they could get them without incurring the suffering a strike would bring, they should do so. Alderman Simpson (the Chairman of the National Negotiating Committee) urged that a sectional strike would produce no good result. He had strong hopes that on that day a way out of the difficulty would be found. The Cheltenham Gas Company had intimated that whatever was the result they would not be parties to it; so that the unions would have to fight in Cheltenham in any case. Mr. Hallas declared that it would be utter folly to strike while the negotiations were proceeding. It would also be dishonourable.

STRIKE DECLARED IN SOUTH WALES.

Gas workers at Neath, Margam, Port Talbot, and Briton Ferry decided on Friday to hand in 24 hours' notices, to expire at noon on Saturday.

MANCHESTER CORPORATION GAS UNDERTAKING.

Annual Report and Accounts.

The Gas Committee of the Manchester Corporation recently met to consider the report and accounts (signed by the Chairman, Alderman William Kay) for the year ended March 31.

The income was £1,432,480, of which sales of gas, after allowing for the rebate under the Coal (Pit's Mouth) Prices Order, 1919, account for £986,277. Residuals show a remarkable increase; coke yielding in all £333,427, tar £79,696, and sulphate of ammonia and sundry receipts £33,080. The expenditure, including a supplementary provision for the renewal of plant, amounted to £1,255,167, showing a gross profit for the year of £177,313. This sum has been appropriated as follows: For interest on loans, &c., £37,903; for income-tax, £8803; for statutory sinking fund, £59,538; for the contribution in aid of the city rate, £31,525; to meet certain capital expenditure, £23,230—leaving a balance of £16,314 to be transferred to the reserve account.

The capital outlay of the undertaking stands at £3,243,926; and the net outstanding loan debt, after allowing for unapplied sinking fund, was £724,115, or 22 p.ct. of the outlay. The renewals fund, after meeting expenditure to the extent of £131,213 for the past year, amounts to £150,797. This fund has been of the greatest possible benefit since it was established in 1906, and especially so at the present time, when renewals deferred through the war have had to be carried out at considerably enhanced cost.

Growth of Business.

There has been considerable difficulty experienced in obtaining the necessary supplies of coal; and the delay caused by the war in carrying out the extension of the manufacturing plant necessary to cope with the increased demand for gas has had a prejudicial effect on the growth of the business. Notwithstanding the abnormal conditions, satisfactory progress has been made. The sales of gas were 5612 million c.ft., which shows an increase of 3·68 p.ct. for the year; and the quantity of coal, &c., carbonized was 475,129 tons, an increase of 18,653 tons.

There has been an increase of 113 million c.ft., or 4·14 p.ct., in the day consumption (from 8 a.m. to 6 p.m.), and 65 millions, or 2·07 p.ct., in the night time (from 6 p.m. to 8 a.m.). The larger increase in the daytime is due to the extended facilities for the use of gas for industrial purposes.

The number of gas-consuming devices installed also shows a satisfactory increase. The total number of cookers and grillers fixed up to March 31 was 139,102, an increase of 5510; while the number of fires was 32,796, an increase of 4765. About 90 p.ct. of the consumers have now been supplied with a cooker, griller, or fire.

The number of consumers taking gas through ordinary meters was 116,079, an increase of 934 for the year; and the revised figures show that there were 76,033 consumers taking gas through automatic meters.

Statistical.

—	Year 1919.	Year 1920.	Increase + Decrease −	Per Cent.
Material carbonized—tons	456,476	475,129	+ 18,653	4·09
Gas made—thousands c.ft.	5,859,350	6,035,367	+ 176,017	3·00
Gas made per ton—c.ft.	12,836	12,703	− 133	1·03
Calorific value, B.Th.U. (gross)	476	464	− 12	2·52
Output of gas from works—thousands c.ft.	5,862,279	6,041,071	+ 178,792	3·05
Gas sold—thousands c.ft.	5,412,822	5,611,903	+ 199,081	3·68
Gas unaccounted for (adjusted)	230,387	235,589	+ 5,202	..
Gas unaccounted-for—p.ct. on output	3·93	3·90	− ·03	..
Total number of consumers (including automatic)	197,071	192,112		
Number of automatic consumers	81,926	76,033	Revised	..
Private lighting—				
High-pressure lamps	1,073	1,202	+ 128	11·93
Low-pressure lamps	1,848	1,559	− 289	15·64
Number of burners maintained	43,358	43,508	+ 150	0·35
Public street lamps				
Within the city	21,025	20,890	− 135	..
Without the city	1,418	1,418	..	..

GAS ACCOUNTS AT COVENTRY.

At a Meeting of the City Council of Coventry, held on Tuesday of last week, the annual report of the gas undertaking was presented. The accounts showed a gross profit for the year of £15,556. From this had to be deducted a sum of £12,496 in respect of capital expenditure defrayed out of revenue—thus reducing the profit to £3060. Adding the balance of £35,113 brought forward from 1919, there was a disposable surplus of £38,173. The Committee recommended that £3000 be paid over to the general district fund in aid of the rates, and that the balance of £35,173 be carried forward to the next account.

In moving the adoption of the report, Alderman Batchelor gave some details of the accounts, and pointed out that workmen's wages, as compared with the pre-war period, had advanced from 30s. per week to 74s. 10d., equal to 150 p.ct.; coal had advanced from 15s. per ton to 41s. 3d., equal to 175 p.ct.; timber, iron, steel, and other materials for the maintenance of the works had advanced from 200 to 300 p.ct. Gas had advanced from 2s. 2d. to 3s. 9d. per 1000 c.ft., an increase of 73 p.ct. The proposed increase of 4d. per 1000 c.ft. would now advance the price to 4s. 1d., which was equal to 88 p.ct. The estimated increase in expenditure for the whole year was £45,000, and of receipts £58,125; showing an increased profit of £13,125. This did not include any provision for possible further increases in expenditure. A comparison of profits for 1920 and 1919 showed a decreased gross profit of £100; increased income-tax, £2593; loan interest, £249; capital expenditure from revenue, £6502; and decreased bank interest, £170; giving a decreased surplus of £9614. As to the future, the Committee were confident that, under normal conditions, the consumption during the current year would increase by at least 10 p.ct. The extensions of the carbonizing plant were now in hand; but it would be impossible to complete these for the coming winter, which would again tax the existing plant above its normal capacity. Much of their satisfactory position was due to the forethought of the manager in buying at the right time.

The Committee had very carefully considered the question of the serious additional expenditure to be met during the current year on account of the recent advance in the price of coal of 4s. 2d. per ton which, together with the increased price of gas oil, amounted to £32,000 per annum. The cost of general materials had also considerably increased. After making full allowance for the increased revenue which it was anticipated would be derived from residuals, and making no provision for increased wages, freights, coal, &c., or extra interest and capital charges, it would be necessary again to raise the price of gas. He (Alderman Batchelor) therefore moved the Committee's recommendation—that the price of gas be increased by 4d. per 1000 c.ft. as from the June readings of meters. Outside the city boundary the price would be 6d. per 1000 c.ft. extra. The amount carried forward, if the recommendations of the Committee were accepted, would be £35,173. It would not be wise to reduce this amount and the cash available for working capital by increasing the amount transferred to the general district fund.

Alderman Batchelor then paid a valedictory tribute to his long association with the Gas Department. The undertaking, he said, was to-day one of the finest and soundest in the country, and was maintained in a thorough and proper manner. It was with a certain amount of regret that he stood up for the last time to move the report of the department, which had a great future before it. It was by no means played-out; and if they only made the best use of it, they would do more towards conserving their coal supplies than in any other way. To turn coal into gas and use it for commercial purposes, lighting, and heating, was the best way to conserve the coal supplies of the country.

The report was duly adopted.

WORKING RESULTS AT BELFAST.

The minutes of the Belfast Gas Committee, submitted and adopted at the meeting of the Corporation on Thursday last, contained a statement of results of the working of the undertaking during the year ended March 31. From this it appeared that the gas made amounted to 3053 million c.ft., an increase of 14·6 p.ct. upon the output of the previous year. Of the total quantity, 2240 million c.ft. was coal gas and 813 million water gas. The net profits of the undertaking, after deducting interest, were £41,666, an increase of £19,343 over the previous year. After providing for stock redemption, contingent renewals, &c., there remained a balance of £26,404, to which had to be added £11,478 brought forward from the previous year; making a total of £37,882. From this was deducted £11,415, allocated for payment of interest and sinking fund on cost of the new City Hall; the net balance to profit and loss being £26,466.

The report of the Engineer and Manager (Mr. J. D. Smith) referred to the trouble experienced during the year in securing coal supplies, and to the inferior quality of that available. The quantity carbonized was 147,896 tons; and the quantity of gas made per ton of coal carbonized (15,418 c.ft.) constituted a record, and was an increase of 1273 c.ft. over the previous year. The gas-stove department profit of £1949 was regarded as satisfactory.

Mr. M'Laurin, in moving the minutes, reminded the Council that the war stopped all schemes of extension, and they had been seriously handicapped for want of the necessary plant. Now, however, a start had been made; and contracts were recently placed for condensers, purifiers, &c., which it was hoped to have in operation next year. On account of the Government increasing the price of coal, the Committee had been obliged to withdraw the rebate allowed some months ago. The price of gas would, from July 1, be 3s. 8d. net per 1000 c.ft., and, in consequence of other costs, they would have to consider a further increase. Coal alone would cost this year an additional £72,758, while wages would account for £35,821 more than last year. The items, with extra charges for materials, fuel for boilers, &c., would involve a very heavy expenditure, which the increase in price of gas to which he had referred would be insufficient to meet. It was estimated that next March, after meeting all liabilities, they would have a deficit of over £12,000; but the Committee were unwilling to add further to the burden of the citizens, and had resolved not to make any further increase in the price of gas just now, but to take the deficit out of their reserve fund. It must be clearly understood, however, that should any unforeseen extra charges arise the Committee would be at liberty to reconsider the matter.

Bangor (co. Down) Gas Extension.—Mr. A. D. Price (Engineering Inspector to the Local Government Board for Ireland) held an inquiry in Bangor, with reference to the Urban District Council's application for a loan of £22,750 for gas-works extensions. Mr. Barker Mitchell (the Manager) said it was proposed to instal an additional bench of eight vertical retorts on the Glover-West system. This would entail an outlay of £21,000; and the balance would be applied to mains. The price of gas was now 6s. 3d. per 1000 c.ft., reduced by discount to 6s., with a large discount for big consumers. The increased production of gas would more than meet the annual charges in respect of the loan.

PROPOSED GRANTON GAS-WORKS EXTENSIONS.

Vertical Retorts and a New Gasholder Recommended.

The Edinburgh and Leith Gas Commissioners have had submitted to them recently a joint report by their Consulting Engineer (Mr. W. R. Herring) and their Engineer and Manager (Mr. Alexander Masterton) on the question of introducing vertical retorts at their Granton works. It is pointed out that, owing to recent important changes in statutory requirements with regard to gas supply, it has been found possible to develop a type of plant comprising vertical retorts similar in many respects to those used at shale-oil works. There are many small installations of these plants in successful operation in Scottish works, and plants of large capacity in English works—notably those at Birmingham, Sunderland, and Leeds—while at Glasgow a plant for carbonizing 1350 tons of coal per day is in process of erection. This vertical type of plant not only reduces labour costs and manufacturing charges, but also yields more gas and bye-products from the coal used. It has a further important advantage, inasmuch as, by the use of steam, a large production of hydrogen and carbon monoxide gases is obtainable simultaneously with the production of coal gas.

The report proceeds to say that in No. 2 retort-house there is space available for plant of this description to carbonize 500 tons of coal per day. The probable inclusive cost, on an outside estimate, would be £200,000, which would involve an annual charge of £15,000 for interest and sinking fund, taken at 7½ p.ct. But as the vertical type of carbonizing plant yields superior results, there would be a total saving of £60,000 per annum consequent upon the increased amount of gas yielded and bye-products recovered, and the reduced costs of labour and maintenance. From this should be deducted the £15,000, leaving a balance of £45,000 per annum, which would be available to reduce the price of gas by some 5d. or 6d. per 1000 c.ft. It would also be possible to introduce further economies in connection with the existing carbonizing plant, which might easily come to £10,000 or more per annum. The reporters conclude by observing that they have no hesitation in saying that the expenditure is more than justified by the large saving in working costs and other economies that would accrue.

In a report dealing with the gasholders, the Engineers state that there is only one gasholder at Granton; the others being distributed over different parts of the area of supply. Most of the latter are in so bad a state of repair, or so small, as to be practically useless. The total present storage capacity is 12½ million c ft., 9½ million c.ft. of which is contained in the Granton, Holyrood, and Blandfield gasholders; the remainder being spread over some nine small holders. A maximum day's output is 11 million c.ft., or 1½ million more than the effective reserve.

As it is an economical advantage to have ample storage capacity, it will be necessary to take steps to provide an additional gasholder and tank at Granton. One of the difficulties in the way of the stoppage of Sunday gas-making operations has been the want of an additional holder at the manufacturing station; and in view of the persistent demands of labour, it may become imperative to make provision for a cessation of Sunday carbonizing in Edinburgh, as is done in many other towns. The operatives are at present paid at the rate of time-and-a-half for Sunday labour; and there is every prospect of this rate being increased. On the basis of time-and-a-half rates, and the suspension of operations from 6 a.m. to 10 p.m. on Sundays, there will be an estimated saving of about £3000 per annum.

For some time material suitable for concrete (of which it is proposed the tank should be constructed) has been set aside. If the tank were commenced early in 1921, the holder could not be ready before the winter of 1923. The Granton holder, including the tank and all subsidiary work, cost about £60,000. It is difficult to estimate what prices may be in 1922 and 1923, when the steelwork of the holder will be tendered for; but the complete construction will probably cost £125,000 to £150,000, of which about £50,000 will be chargeable to capital account.

The Commissioners decided that the reports should stand over for later consideration.

SOUTHPORT CORPORATION GAS ESTATE.

Annual Report.

Mr. John Bond, the Engineer and Manager, yesterday submitted to the Southport Town Council his annual report on the working of the gas estate for the year ended March 31.

The increase in the consumption of gas amounted to 50,366,900 c.ft., which is equivalent to 9·49 p.ct. compared with last year's figures. This comparatively large increase is attributed to (1) the removal of the restriction under the Household Fuel and Lighting Order, 1918, and (2) to a deficiency of household coal. The prepayment system took 20·88 p.ct. of the gas supplied, an increase of 0·65 p.ct. on last year's figures. The average price received for all gas amounted to 3s. 6·75d. per 1000 c.ft. The total capital expended per 1000 c.ft. of gas sold was 10s. 8·97d., as compared with 11s. 7 80d. for 1919. The capital outstanding per 1000 c.ft. of gas sold was 5s. 4·27d., as compared with 5s. 9·32d. The gross profits for the year amounted to £16,109; and after paying £11,221 towards interest and sinking fund, and contributing £3200 towards the relief of rates, there is a balance of £1688. Of this amount, £1640 goes to liquidate a debt occasioned by relieving the rates during the years 1916 and 1917—leaving a credit balance of £49 to be carried forward. There has been an addition to the capital account of the sum of £3083 for new mains. The capital account (total amount expended) now stands at £312,233, and the capital outstanding, after deducting payments from time to time through the sinking fund, at £155,598. The gas-making material used was: Coal, 48,266 tons (increase, 3393 tons); oil, 254 tons (increase, 176 tons); coke for carburetted water gas, 1263 tons (increase, 1081 tons).

During the year, various increases in wages and reduction of hours have taken place in accordance with the Industrial Courts award; also advances have been given to men following their employment as tradesmen. The administrative staff have been granted advances under the Civil Service awards. Advances have also taken place, of various amounts, on all material used in the manufacture of gas. At the commencement of the financial year, coal was advanced 6s. per ton. But in accordance with the Wholesale Prices Order, 1919, dated Nov. 28, 1919, all coal used for manufacturing gas for household purposes was reduced by 10s. per ton; and as the Board of Trade's classification of gas for domestic and industrial purposes differed from the classification laid down by the Gas Committee, no less than 90 p.ct. of the coal was carbonized to produce domestic gas, which was reduced in price from 4s. to 3s. 6d. per 1000 c.ft.—commercial gas being sold in accordance with the scale adopted by the Gas Committee. After the Gas Department had been put to considerable trouble and expense in endeavouring to work in accordance with the regulations of the Board of Trade, the Order was abolished, and the coal used for producing gas for domestic purposes was advanced 14s. 2d., and that used for producing gas for industrial purposes was advanced 4s. 2d. per ton; both advances taking effect as from May 12 last. The maximum and minimum makes of gas during twenty-four hours were 2,135,000 c.ft. and 1,169,000 c.ft. respectively. Of the 614,761,000 c.ft. of gas made, 555 474,200 c.ft. were sold to private consumers; 25,572,800 c.ft. were consumed by public lamps; 400 c.ft. were sold for filling gas-bags on motor vehicles; 8,835,400 c.ft. were used at the works and offices; and 24,878,200 c.ft. (4·05 p.ct.) were unaccounted-for gas.

WEST BROMWICH GAS UNDERTAKING.

Annual Report of the Engineer.

Dealing with the subject of maintenance, in his report to the West Bromwich Corporation Gas Committee for the year ended March 31, Mr. J. W. Allin (Gas Engineer and Manager) says that the installation of vertical retorts has been overhauled by Messrs. T. Vale and Sons. The total cost of maintenance of the vertical installation for the year amounted to £2020 (including Messrs. Vale's charges for the work referred to). Last year the cost of maintenance was £1679. In his report for the year ended March, 1919, Mr. Allin expressed an opinion that the unsatisfactory working of the plant was due to structural defects; and, on examination, he says, this proved to be correct. The whole of the flues for the circulation of primary and secondary air and the waste gases were found to be almost disintegrated, due to the action of water percolating from the ash-pans into the flues and fire-brick work. All defective brickwork and flues has been renewed, also the ash-pans; and the possibility of recurrence of this trouble has been minimized by providing reinforced concrete receptacles for the ash-pans. In the event of leakage from the pans, the water will be conducted outside the retort-settings; and this will indicate any defect which might lead to similar trouble. Repairs can be effected before damage to the setting occurs. Since the repairs were completed, and the plant put fully to work, considerably improved results have been obtained, an output of 1,000,000 to 1,100,000 c.ft. per 24 hours being maintained, as against a nominal capacity of 1,250,000 c.ft. per 24 hours. The plant has been subjected to severe usage due to the action of water and irregular heating owing to the defective flues; and since improved working heats have been obtained, other defects caused by the former trouble, which could not be foreseen, have developed in several of the retorts. These are being repaired by the department's own retort-setters; and it is hoped to have the plant still further improved for the coming winter season.

The quantity of coal carbonized during the year was 32,407 tons, compared with 31,860 tons in the previous year. The make of gas per ton was 12,790 c.ft., as against 12,924 c.ft,; the reduction being entirely due to the quality of the coal. Higher prices had to be paid for this inferior coal. The same conditions still obtain; and at the present time, a proportion of steam coal is being supplied for gas-making purposes. An effort is now being made to increase the stocks on the works, but with inferior coal. The cost of the coal carbonized during the year amounted to £49,157, compared with £40,795—an increase of £8362. This increase is due to the greater quantity used (547 tons extra), and to the increases in price.

The total gas made during the year was 469,174,051 c.ft., as against 452,821,645 c.ft., an increase of 3·8 p.ct. The quantity of water gas made was 54,703,400 c.ft., as compared with 41,068,000 c.ft. There were used in water-gas manufacture 29,600 gallons of gas oil, as compared with 40,054 gallons. The decreased quantity of oil used was due to the reduced standard of calorific value (450 B.Th.U.) laid down by the Government.

There was an increase in the sales of gas over the previous year, amounting to 25,433,776 c.ft., or 6·2 p.ct., the total quantity of gas sold being 433,150,748 c.ft., as compared with 407,716,972 c.ft. The gas unaccounted-for was 6·36 p.ct., as against 8·19 p.ct. The previous year's figure was inflated, owing to the fact that a large number of inspections of automatic meters were not made by the year-end, due to the retarded delivery of change-wheels, &c., needed consequent upon the revised charges for gas supplied.

Owing to the continued advances in the cost of coal, wages, and materials, it was found necessary to apply for power to increase the maximum price chargeable for gas from 4s. to 5s. per 1000 c.ft., which enabled the Committee to revise the charges from time to time to meet this additional expenditure.

The gross profit for the year was £10,318, as against £7357. Interest and sinking fund charges were £8235, leaving a net profit on the year's working of £2083, which compares with a deficit of £927 a year ago.

Hull Corporation Gas Undertaking.—The accounts of the Hull Corporation gas undertaking for the year ended March 31 show a surplus of £808. The net revenue balance, after adding the year's surplus, stands at £6049. The reserve fund, with the addition of £211 interest for the year, now amounts to £6255; while there is in the sinking fund £14,791, against a loan indebtedness of £54,632.

LANCASTER GAS-WORKS MANAGEMENT.

Mr. George Dixon, Gas Engineer and Manager, submitted his first annual statement to the Lancaster Town Council last Wednesday. It showed that during the past twelve months the gas made amounted to 279,626,000 c.ft. The capital employed was £5 14s. 3d. per ton of coal, or 8s. 7½d. per 1000 c.ft. of gas sold. Coals carbonized amounted to 20,061 tons. The make of gas per ton of coal was 13,854 c.ft. The gas unaccounted-for was 4·23 p.ct.; and the net proceeds of residuals on the cost of coal were 75·1 p.ct.

Acknowledgment was made of Mr. Dixon's efficient management; and his salary was increased from £450 to £550 a year. The services of Mr. C. Armitage (Engineer for 28 years), who since October, 1913, has held an appointment as Consulting Engineer, were after a lengthy discussion dispensed with; the Council feeling that this was due to Mr. Dixon, who was quite capable of managing the works. But they decided to continue the payment of £150 per annum to Mr. Armitage, as a retiring allowance. It will be remembered that Mr. Armitage retired, and his son Mr. C. R. Armitage was appointed Manager; but he has now an appointment in the Midlands. Mr. Till (the Chairman of the Gas Committee) reminded the Council that, though Mr. Armitage had a salary of £500, he could have earned much more had he accepted offers elsewhere, as his son had done. His management, said Councillor Briggs, was so sound that much money went to the relief of the rates, and the price of gas was the second lowest in the country.

STOKE-ON-TRENT GAS-WORKS RESULTS.

There was submitted at a recent meeting of the Stoke-on-Trent Town Council, by Mr. C. Bowers (the Vice-Chairman of the Gas and Electricity Committee), a very satisfactory report as to the financial position of the four gas-works belonging to the Corporation.

Mr. Bowers, at the outset, said that the undertaking was in a sound financial position. During the twelve months just ended, the expenditure on the four works increased by £36,157, while the income increased by £34,227; showing that the additional income was £2130 less than their extra expenditure. Manufacture alone cost £27,196 more than the previous year, and distribution £5004 more; while the gas income only showed an increase of £14,667; and they had an increase of £19 350 from residuals. It was satisfactory to report that there was a net profit on the four works of £696. On the four works there was an increase in gas made of 95 million c.ft. for the year; while there was a reduction in gas unaccounted-for. He drew attention to the importance of gas-firing for the pottery industry. At the present time, he said, there were probably five or six tunnel ovens in the Potteries; but in twenty years there might be a thousand. It was not unreasonable that they should look ahead, and consider the desirability of laying a main which could give high-pressure gas to these factories on a paying basis.

The following figures show the general working results for the year ended March 31, secured under the supervision, as Chief Engineer and Manager, of Mr. Alexander Mackay.

	Burslem.	Stoke.	Fenton.	Longton.
Gas made.	C.ft.	C.ft.	C.ft.	C.ft.
Coal gas	242,228,000	159,575,000	162,395,000	186,027,000
Water gas	—	—	—	10,921,000
	242,228,000	159,575,000	162,395,000	196,948,000
Increase gas sold	33,632,800	21,932,000	16,886,400	21,174,600
Increase gas sold, p.ct.	18·30	18·88	13·57	14·60
Coal carbonized, tons	18,070	10,991	11,400	13,013
Gas made per ton (c.ft.)	13,404	14,518	14,245	14,295
Gas unaccounted-for, p.ct.	9·13	12·77	11·85	13·31
Meters in use:				
Ordinary	1,958	1,511	587	1,400
Automatic	6,402	5,308	4,396	6,632

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *July* 5.

In the London tar products market, pitch maintains a strong position; and over 170s. net per ton f.o.b. is said to be obtainable for next season's shipment. There is also a good home inquiry. Creosote is about 1s. 3d. net per gallon in bulk. Large deliveries of tar materials for roads are being taken; the requirements this season being far above the normal. The position of toluol and solvent naphtha is unchanged.

There is nothing new to report in the position of sulphate of ammonia for home agriculture.

Tar Products in the Provinces.

July 5.

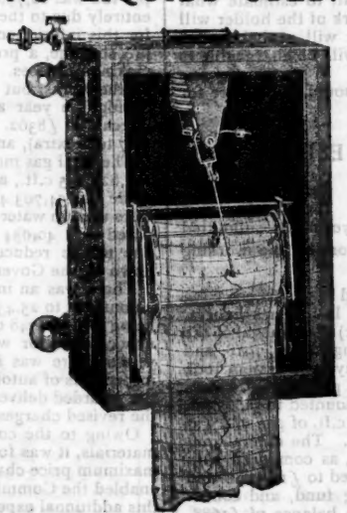
The average values for gas-works products during the week were: Gas-works coal tar, 99s. to 104s. Pitch, East Coast, 162s. 6d. to 167s. 6d. per ton f.a.s.; West Coast—Manchester, 147s. 6d to 152s. 6d.; Liverpool, 147s. 6d. to 152s. 6d.; Clyde, 147s. 6d. to 152s. 6d. nominal. Benzol 90 p.ct. North, 2s. 6d. to 2s. 7d.; crude 65 p.ct. at 120° C., 1s. 8½d. to 1s. 9d. naked at makers' works; 50-90 p.ct. naked, North, 2s. 4d. to 2s. 6d.

SIMMANCE'S DEAD BEAT RECORDER

TAPE CHART PATTERN

For Pressure or Vacuum.

NO LIQUIDS USED.



The chart roll is renewed 6 times a year.

The record can be torn off at any interval.

Lowest Range: 0-2 inches water.

Highest Range: 0-300 lbs. per sq. inch.

Suitable for Gas, Air, Water, or Steam, and may be used on Crude Gas.

MAKERS:

ALEXANDER WRIGHT & Co., Ltd., WESTMINSTER

Toluol, naked, North, 2s. 6d. to 2s. 7d. nominal. Coal tar crude naphtha in bulk, North, 11½d. to 1s. Solvent naphtha, naked, North, 3s. 1d. to 3s. 3d. Heavy naphtha, North, 3s. 4d. to 3s. 6d. Creosote, in bulk, North, liquid, 11½d. to 1s.; salty, 10½d. to 11½d. Heavy oils, in bulk, North, 1s. to 1s. 0½d. Carbolic acid, 60 p.ct., 4s. to 4s. 1d. Naphthalene, £35; salts, £9 to £9 10s., bags included. Anthracene, "A" quality, 9d. per minimum 40 p.ct.; "B" quality, nominal.

FROM A MARKET CORRESPONDENT.

Tar Products.

Tar products are practically without change, and values well maintained; this being one of the few markets which has not been affected by fears of a general slump—indeed, in many directions there is still a tendency to rise. This is especially the case with pitch, which is in strong demand on export account. The current value in the North is about £8 10s. per ton, with much higher prices predicted before September. Tar is likewise very firm at up to 95s. per ton. Solvent naphtha keeps steady on a very small demand. At the same time supplies are not great. Heavy naphtha is without change. Naphthalenes also are firm at late rates. Creosote remains about 1s. 2d. per gallon; and although "talked" higher, it is difficult to see how prices can be advanced without affecting production. There is not much demand for carbolic acid; and though crystal is nominally 1s. 4d. per pound, it could probably be obtained for 2d. less. Cresylic acid is dearer; pale straw 97/99 p ct. making 5s. 9d. per gallon, drums free. Intermediate products are not much changed. Export licences are not readily obtainable; the home demand being on a large scale. Prices move up slowly.

Latest quotations are as follows:

Benzol: 90% London 2s. 5d. to 2s. 7d., North 2s. 4d. to 2s. 6d.; 50-90% 2s. 3d. to 2s. 4d. London, 2s. 2d. to 2s. 3d. North; crude 60-65% 1s. 6d. to 1s. 8d.; pure, 4s. per gallon naked.

Crude Tar: London, 87s. 6d. to 90s.; Midlands, 85s. to 87s. 6d.; North, 85s. to 90s. per ton *ex* works. Refined tar, 65s. per barrel (free) on rail.

Pitch: London, 170s. per ton; East Coast, 165s. to 170s. per ton; West Coast, 165s. to 170s., with Manchester 170s. per ton, and Glasgow 170s. per ton; South Wales, 180s. per ton.

Solvent Naphtha: London, 3s. 9d. Provinces average 3s. 3d. per gallon.

Crude Naphtha: Naked, 10d.; North, 9d. per gallon.

Heavy Naphtha: 3s. 6d. per gallon.

Naphthalene: Refined, £48 per ton nominal; inferior, £35; crude, £14 to £22, according to quality.

Toluol: Naked, 2s. 9d. per gallon nominal. North, 2s. 7d. Pure, 4s.

Creosote: London, 1s. 1d. to 1s. 2d.; North, 1s. 1d.; heavy oil, 10½d. per gallon in bulk.

Anthracene: 40-45%, 9d. per unit per cwt.

Grease Oils: 18° Tw. (naked), £6 10s. per ton f.o.r. makers' works.

Pyridine: 20s. to 25s. per gallon.

Aniline Oil: 1s. 9d. to 1s. 10d. per lb., drums extra.

Aniline Salts: 2s. to 2s. 2d. per lb.

Cresylic Acid: 95%, 4s. 9d. to 5s. 3d.; 97-99%, 5s. 4d. to 5s. 8d. per gallon *ex* works London, f.o.b. other ports.

Carbolic Acid: Crude 60%, 4s. 6d. per gallon; crystals 40%, 1s. 3d. to 1s. 4d. per lb. (nominal).

Salicylic Acid: Technical, 3s. 0d. to 3s. 3d.; B.P., 3s. 9d. per lb.

Xylol: Pure, 6s.; commercial, 4s. 9d. per gallon.

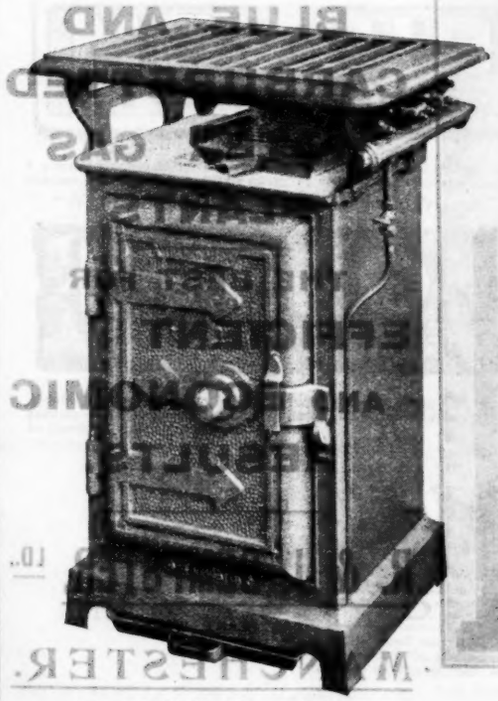
Sulphate of Ammonia.

The position here does not show much change. Demand is fair, but not heavy, except on Irish account. The home price of £23 10s. cannot be regarded as too high, although it may appear so by comparison with pre-war figures. For export, a little more business is passing; but it is difficult to state prices definitely, as much as £50 being reported paid in some cases. Anyway, export prices are very substantial; and this trade must now be yielding a very good profit.

Chelmsford Gas-Works Results.—The accounts of the Chelmsford Corporation gas undertaking for the year ended March 31 show that the revenue was £39 827, and the net profit £1153. There was an increase of 335 tons in the coal carbonized, and of 3,812,000 c.ft. in the gas made. As the year commenced with a debit balance of £594 (which represented the loss on two years' working), the charge for gas was raised to 4s. 9d. per 1000 c.ft. as from April 1; and in consequence of the continued rise in the price of materials and labour, it was necessary to further increase the price to 5s. 7d. per 1000 c.ft. at the beginning of the September quarter. The make of gas was 125,889,000 c.ft., as compared with 122,077,000 c.ft. in the previous year. The net proceeds from residuals on the cost of coal were 54·46 p.ct. As to wages, the increased cost for the year was £3435.

Tar for Roads at Southend.—At a meeting of the Southend Corporation Highways Committee, the Borough Surveyor reported that, in addition to the tar now being obtained from the Leigh Gas-Works, it was necessary that approximately 5400 gallons per week should be bought in order to enable the work of tarring the roads to be properly carried out. He had secured from the Southend Gas Company a sample of their tar, and was experimenting with it. It was resolved that, in view of the difficulty in securing the requisite amount of tar, the Gas Committee be asked to supply to the Highways Department all the tar that could possibly be allotted for their use. Instructions were also given to the Borough Surveyor to report to the next meeting of the Committee the result of his experiments with the sample of tar received from the Gas Company, and to purchase tar from them if suitable.

The "New Main" Cookers.



THE latest product from the House of Main is indeed the last word in Gas Cooking Stoves.

Constructed of highest grade cast iron and porcelain enamelled steel, with first-class brass work.

The "New Main" is a series with many outstanding improvements.

One special feature is the treble crown in the oven roof; this is packed with slag wool, reducing heat loss to an absolute minimum.

Investigate the "New Main." Let us send you a sample.

R. & A. MAIN, LTD.

WORKS: Gothic Works, EDMONTON, N.18; Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.

SHOW-ROOMS AND BRANCHES: 25, Princes Street, Oxford Circus, W.1; 82, Gordon Street, Glasgow; 18, Severn Street, Deansgate, Manchester; 97, Millfield, BELFAST; 6, Narrow Wine Street, BRISTOL; 333, Queen Street, MELBOURNE.

Gas Manufacturing Operations in New York.

The magnitude of the operations of the Consolidated Gas Company of New York and the affiliated undertakings (the New Amsterdam Gas Company, the Standard Gas Company, the New York Mutual Gas Light Company, the Central Union Gas Company, and the Northern Union Gas Company) is graphically presented in an article in "Gas Logic," which points out that the whole concern represents a financial investment of many millions of dollars. It seems that there are thousands of "customers" who appear not to be daily users of the gas of the Consolidated Company. The records of the Company for last April indicate that 16,700 of them did not use any gas, while 19,700 consumed from 100 to 400 c.ft. The affiliated Companies also show large figures among these two classes. All the Companies combined must be ready to supply 34 billion c.ft. of gas a year—in fact, over 166 million c.ft. were sent out one day last winter. It was for the purpose of providing, not only for the present and the immediate future, but for many years to come, that the purchase was made of 377 acres of land, with an extensive water frontage, at Astoria (L.I.), where the Astoria Light, Heat, and Power Company (a subsidiary of the Consolidated Gas Company) now possess what is claimed to be the largest gas manufacturing plant in the world. Two of the units here are devoted to the manufacture of coal gas; the third, to that of water gas. A further water-gas unit, of a capacity of 30 million c.ft. of gas daily, is in course of erection, so as to be ready for operation next winter. This will make the total daily capacity of the Astoria plant 80 million c.ft. At the works is the 15 million c.ft. holder, which is 260 ft. in height and 300 ft. in diameter. The tank for another holder of the same size has just been constructed. For the supply of Manhattan or the Bronx gas passes from the holder referred to through the tunnel under the East River which has already been described and illustrated in the "Journal." In this tunnel (which is 21 ft. high and 19 ft. wide, and 150 ft. below the bottom of the river) there are two mains 6 ft. in diameter.

Gas Manufacturing Difficulties in Quebec.—It was stated in a despatch sent-off towards the end of May that Quebec City was liable to have its gas supply cut off in June, on account of the Quebec Railway, Light, and Power Company's inability to secure the necessary quantity of gas oil. The Company might be obliged to close their St. Molagas works.

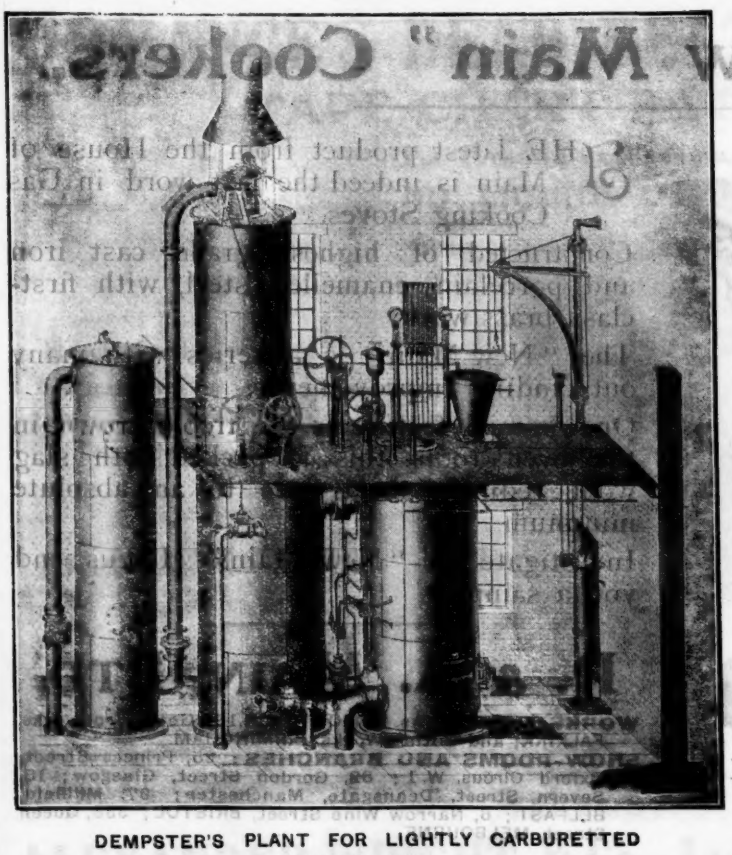
Morley Gas Accounts.—The financial statement for the year ended March 31, submitted by the Gas Manager (Mr. H. J. Hemingway) to the Morley Town Council showed an income of £36,722, an increase of £6901, and a working expenditure of £26,620, an increase of £4902. The total revenue from the sale of gas was £26,475, as against £21,003 in the previous year. The net profit of £768 this year compares with a deficit last year of £1242. The gas production was 147,390,000 c.ft. Coal costing 12s. 5d. in 1914 was now 34s. 10d., and the quality was worse.

Fire at the Derby Gas-Works.—A fire occurred at the Litchurch works of the Derby Gas Company last Monday week. About 1.30 a.m., the fire brigade received a call, and upon reaching the gas-works it was found that the dehydrating plant was in flames. One of the workmen, it appears, drew the fire from the plant, in preparation for closing-down, when a spark set light to some oil which had been spilled on the ground. In a very few minutes 300 barrels of crude naphtha, a tar-tank on wheels, and the dehydrating plant were all ablaze. The brigade worked until nearly 4 o'clock before they extinguished the fire, which caused damage estimated at over £1000.

Working at Brighouse.—The annual financial statement in connection with the Brighouse municipal trading undertakings, submitted to the Town Council on June 30, shows that on the gas-works there was a gross profit of £7744; but the net profit is reduced to £553 after payment of £7191 for interest and sinking fund. The total income was £47,879. Mr. J. F. Bottomley, on behalf of the Gas Committee, said considerable difficulty had been caused by the suspension of coal supplies from Low Moor; but the department had nevertheless had excellent results, and the price of gas was the lowest in the district. The total cost of the works had been £146,000; and they now stood in the books at only £23,680.

Retford Gas Prices.—The position of the gas undertaking was discussed at a meeting of the Retford Town Council, when Alderman Thornton submitted a report of the Gas Committee recommending that the price of gas be increased from 4s. 8d. to 5s. per 1000 c.ft. He explained that with the 5 p.ct. discount for prompt payment, the new charge would be 4s. 9d., which still compares favourably with the price of gas in neighbouring towns—especially in view of the fact that Retford charged nothing for the hire of meters. He held out no hope of gas prices being reduced, at any rate until the Council began to feel the benefit of the increased sales which would follow when the new mains were completed. So far as they could estimate, the increase in the charges was made to cover the anticipated cost of these mains.

Welsbach Light Company, Ltd.—In the report to be submitted to the annual meeting of shareholders to-day, the Directors point out that the profit and loss account shows a net profit (subject to excess profits duty for the year) of £61,688, to which must be added the balance brought forward from last year, and a deduction made therefrom for the estimated liability for excess profits duty for the year, as shown by the accompanying balance-sheet, leaving for appropriation £67,453. The Directors recommend the payment of a dividend of 10 p.ct. per annum (less income-tax) on the old shares only, £17,500; the payment of a bonus of 5 p.ct. (less income-tax) on the same shares, £8750; the writing-off of the balance of underwriting commission (1911 and 1916), £19,859; leaving a balance to be carried forward of £21,343 The Directors regret to have to report the retirement from the Board during last year of Mr. Charles Lock, owing to serious ill-health, and record their sense of his services to the Company during a difficult period.



DEMPSTER'S PLANT FOR LIGHTLY CARBURETTED WATER GAS.

DEMPSTER'S
COMBINATION OF
BLUE AND CARBURETTED WATER GAS PLANTS

THE BEST FOR EFFICIENT AND ECONOMIC RESULTS.

R. & J. DEMPSTER, LD.,
GAS PLANT WORKS,
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Telephones: 54 and 2296 Central.
LONDON TELEPHONE: VICTORIA 7426.

Mr. Thornton's Society of Arts Paper.

On the 30th ult., the 166th annual general meeting of the Royal Society of Arts was held, and in the course of the report presented by the Council the following reference appeared to the paper Mr. H. M. Thornton read during the past session—the third he had contributed to the "Transactions." "During the war great advances were made in this direction; and in his paper, 'Gas in Relation to Increased Output and National Economy,' he summarized the results of this development. The subject was dealt with under four heads: (1) The eliminating of waste; (2) the cheapening of production; (3) the speeding-up of output; and (4) the human element, or improvement of working conditions. Owing to the fact that it is possible to regulate the heat of gas-fired furnaces with great precision, there is little danger of wasting material in consequence of subjecting it to too high or too low temperatures; and by using gas it is also possible to save all the valuable bye-products of coal. A double economy was claimed for the gas-furnace, compared with the coke furnace. Not only is the value of the gas consumed less than that of the coke consumed, but the amount of labour required to attend to gas-furnaces is also considerably less than that required for coke-furnaces. Further, the gas-furnace is cleaner and more easily handled; and evidence from several works was quoted by Mr. Thornton, showing that in cases where gas-furnaces had been introduced, even though at first the men were disposed to resent them, they had soon became warm partisans."

Caterham Hospital Lighting.

The Works Committee of the Metropolitan Asylums Board have been investigating the question of the lighting of Caterham Mental Hospital, and report that the institution is at present lighted by gas which is made at the gas-works on the site. In view of the heavy cost (nearly 7s. per 1000 c.ft.), the Committee have had under consideration the question either of discontinuing the making of gas and taking a supply from an outside source, or substituting electric lighting for gas lighting. To aid them in their deliberations they have had a report on the matter by the Engineer-in-Chief, who estimates the cost of installing the necessary wiring at £8000, while the annual cost of electric lighting and the necessary gas for cooking purposes, &c., would be approximately £1300, neglecting the interest on the capital outlay for wiring and the depreciation. The present cost of manufacturing their own gas is approximately £2200 per annum; so that electric lighting would be considerably cheaper than gas. The Croydon Gas Company offer to supply gas at the rate of 4s. 9d. per 1000 c.ft., with a discount of 10 p.ct., which represents an annual cost for lighting, cooking, &c., with gas supplied in this way of (say) £1450. He estimates the cost of coupling-up, including the meters, at £750. If the scheme of electric lighting is proceeded with, there would be an additional outlay required of £450 for connecting-up to the Croydon Gas Company's mains to supply the gas necessary for cooking, &c. The Committee are unanimously of opinion that the time has come when it would be advantageous to take a supply of gas from outside.

The Bradford Corporation, determined to have pedestrians on the safe side in case of a strike of gas workers, have whitened walls and corners, as in the days of air-raids.

The Dundee Gas Commissioners are obtaining tenders from contractors for excavation work, the construction of a ferro-concrete tank, and the erection of a spiral-guided gasholder.

The Smethwick Town Council have decided to grant a rebate of 6d. per 1000 c.ft. to consumers of gas for domestic purposes, until the whole of the coal purchased under the recent Order is exhausted.

The Directors of Messrs. Gibbons (Dudley), Ltd., have declared interim dividends on the preference shares of 7 p.ct. per annum, and on the ordinary shares of 10 p.ct. per annum, free of income-tax, for the six months ended June 30.

Messrs. Drakes, Ltd., of Halifax, have had to write to the Strabane (co. Tyrone) Urban District Council, in respect of a contract for work in connection with the local gas undertaking, that owing to the present state of affairs in Ireland the workmen are refusing to go there.

Through the electric light fusing, many thousands of pounds worth of damage was done last Saturday afternoon by a fire which occurred in the tapestry room at Nostell Priory, the seat of Lord St. Oswald. Fire broke out on Thursday last at the Phœnix Mills, Huddersfield, owing to the fusing of electric wires, which set light to the woodwork of the roof.

On the 2nd inst., three men lost their lives in a well at the Atherton (Bolton) Gas-Works. David Matthews descended the shaft for the purpose of turning a tap to let off water which had accumulated in it. He signalled that he was in difficulties, and William Whittam and Samuel Marsh went to his assistance. They were, however, all overcome, fell into the water, and were dead when reached.

Over 15,000,000 workers, men and women, besides almost all the employers of the nation, are affected by changes in the National Health Insurance which came into force on Monday last. Under the 1911 Act, the contribution payable in Great Britain was 7d. a week in the case of a man worker, and 6d. in the case of a woman, of which amounts the worker's share was ordinarily 4d. for men and 3d. for women—the employer paying the remainder. After July 5 the contribution payable will be 10d. a week in the case of a man, and 9d. in the case of a woman. The employer will normally contribute 5d. of the amount in each case, which means that the man worker will in future usually pay 5d. a week instead of 4d., and the women 4d. instead of 3d. In return for this increase in payments there will be a material increase in benefits. Thus, the amount payable to a man who is away from his work through illness will be 15s. a week, instead of 10s. as formerly; to a woman worker, 12s. a week, instead of the present 7s. 6d. Disablement benefit will be 7s. 6d. a week in each case, instead of 5s.

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STOCK MARKET REPORT.

THE Stock Exchange has had but a broken week; having been closed on Thursday in harmony with those indispensable institutions, the Banks. And then, on the isolated Friday, business had scarcely a fair chance of getting into swing again. However, after a somewhat shy opening, the tone became tolerably fair for the most part, though not all round.

In the gilt-edged group, Home Government issues (excepting Victories) made moderate advances. Friday's figures were: Consols 46¾-47¼. War Loan 84⅛-84⅜. Funding 69⅝-70. Victory 75⅝-76⅛. War Bonds were in good demand, and some of the municipals were firm. Indian loans were easier.

Home Rails were depressed; the Geddes programme not being popular. Canadians were easy; but Argentine were steady.

The Foreign Market was more cheerful. French, Belgium, Greek, and South American issues were well supported; but Russians and Chinese were weak.

The Miscellaneous Market offered but few bright points. Rubbers acted irregularly, and Oils were decidedly weak. Shipping was in better favour; but Iron and Steel, Nitrates, Banks, and Textiles were not.

Business in the Gas Market did not aggregate much in the four working days of the week that were left, and changes were few and slight in degree. But among the London companies was a movement which, albeit as yet of little magnitude, one would like to hail as a nascent recognition of the improvement conferred by the passing of the Gas Regulation Bill through the Commons, and one which will develop further. This move was the advance of Gas Light and South Metropolitan ordinaries to 56. The Bill has a peaceful prospect in the Lords this week; and, when it issues, further advances may be expected.

Bargains done for cash during the week were as follows: On Monday, British 25, Gas Light ordinary 52⅝, 53¼, 54, ditto preference 56½, 57⅛, 57⅝, 58, Imperial Continental 124, Primitiva debenture 69½, 70, South Metropolitan 52½, 54, South Suburban 60½, 62, Tottenham debenture 60⅝. On Tuesday, Brentford "B" 48, Commercial 4p.ct., 55. Gas Light maximum 40, Primitiva 17s. 6d., ditto preference 35s., Sheffield "C" 54, South Metropolitan 55, South Suburban 61, 62. On Wednesday, British 23, Commercial 3½ p.ct. 46, Continental Union 29¾, 29½, European 5¾, Gas Light ordinary 54¼, 54⅜, 55½, ditto maximum 40, ditto debenture 46½, 47, Imperial Continental 124½, 125, 125½, ditto debenture 83, Primitiva 15s., ditto preference 30s., 35s., South Metropolitan 53¼. On Thursday, the London Stock Exchange was closed. On Friday, Gas Light ordinary 53⅜, 56, Imperial Continental 124, Newcastle 61¼. Primitiva preference 32s. 6d., South Metropolitan 53½, 56, South Suburban 61, Malta and Mediterranean 7½ p.ct. preference 19s., Metropolitan of Melbourne shares 8 1/16, 8¼.

In the Money Market, the position was, of course, dominated by the turn of the half year. A heavy and increasing demand for accommodation produced a condition of great tightness, which only eased-off on Friday. Discount business was not agitated, and rates were steady until Friday. The Bank rate is 7 p.ct., as fixed on April 15.

With the title of "Twi-Lights, Ltd.," a company of gas-burner manufacturers was registered on June 30 with a capital of £5000 in £1 shares.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
182,049	Stk.	Mar. 11	4	4%	Aldershot 4 p.c. Pref.	...	58—63	...
1,551,868	,,	Mar. 26	2½	3⅛%	Alliance & Dublin Ord.	59—64	42—47	...
374,000	,,	Jan. 15	4	4%	Do. 4 p.c. Deb.	76—79	57—62	...
280,000	5	May 13	7½	8%	Bombay, Ltd.	5⅛—6⅛	4⅛—5⅛	...
50,000	10	Feb. 26	16	10%	Bournemouth Gas and Water: 10 p.c.	29—30	8½—9	...
383,110	10	,,	7	7%	Bournemouth Gas and Water: B 7 p.c.	15—15½	9—10	...
115,000	10	,,	6	6/-	Bournemouth Gas and Water: Pref. 6 p.c.	13¾—14	8—9	...
162,065	—	June 25	—	4%	Bournemouth Gas and Water: 4 p.c. Deb.	...	62—64*	...
992,045	Stk.	Feb. 12	14	30/-	Brentford A Consolid.	261—266	47—52	...
734,920	,,	,,	11	26/3	Do. B New	204—209	45—50	48
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	70—75	...
221,400	,,	June 10	4	4%	Do. 4 p.c. Deb.	91—93	63—65	...
214,775	,,	Mar. 11	11	7½%	Brighton & Hove Orig.	208—213	121—126	...
244,200	,,	,,	8	5⅓%	Do. A Ord. Stk.	154—159	80—85	...
1,287,500	Stk.	Feb. 26	5	5%	Bristol 5 p.c. max.	...	...	...
530,000	20	April 14	12½	10%	British	44—45	23—25	23—25
120,000	Stk.	June 25	4	4%	Do. 4 p.c. Deb. Stk.	88—90	57—59*	...
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	45—48*	...
100,000	10	May 27	—	—	Cape Town & Dis., Ltd.	1¾—2¼	7—7½	...
100,000	10	,,	—	4½%	Do. 4½ p.c. Pref.	4—6	5½—6½	...
100,000	Stk.	June 25	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	56—61*	...
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	...	...
1,513,280	,,	Feb. 26	5/9/4	33/4	Commercial 4 p.c. Stk.	106—108	51—56	55
560,000	,,	,,	5¼	26/8	Do. 3½ p.c. do.	103—105	44—49	46
475,000	,,	June 10	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	45—47	...
800,000	,,	Dec. 11	4	—	Continental Union Ltd.	76—79	27—32	29¼—29½
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	40—60	...
51,600	,,	Feb. 26	14½	10⅓%	Croydon A 10 p.c.	...	130—140	...
278,400	—	,,	11½	7⅔%	Croydon B and C 7 p.c.	...	90—100	...
492,270	Stk.	—	6	5%	Derby Con. Stk.	123—125	...	...
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	...	...
1,002,180	10	Jan. 29	10	5/0	European, Ltd.	17¼—18	5¼—6¼	5¼
16,298,975	Stk.	Feb. 12	4/17/4	30/-	Gas 4 p.c. Ord.	98—102	53—56	52¾—56
2,600,000	,,	,,	3½	26/8	Light and Coke: 3½ p.c. max.	76—79	37—42	40
4,062,235	,,	,,	4	4%	Light and Coke: 4 p.c. Con. Pref.	96—99	55—58	56½—58
4,674,850	,,	June 25	3	3%	Light and Coke: 3 p.c. Con. Deb.	72½—74½	45—48*	46½—47
130,000	,,	Dec. 11	10	10%	Light and Coke: 10 p.c. Bonds.	...	...	...
82,500	,,	Mar. 11	5	3⅓%	Hastings & St. L. 5 p.c.	...	55—60	...
258,740	,,	,,	3½	2⅓%	Do. 3½ p.c.	87—89	38—43	...
70,000	10	May 13	11	7%	Hongkong & China, Ltd.	16¼—16½	8½—9¼	...
86,600	Stk.	Mar. 11	9	6⅓%	Hornsey 7 p.c.	...	88—93	...
131,000	,,	,,	7½	5⅓%	Ilford A and C	151—154	86—91	...
65,780	,,	,,	6½	4⅓%	Do. B	115—118	65—70	...
65,500	,,	June 25	4	4%	Do. 4 p.c. Deb.	92—94	55—58*	...
4,940,000	,,	May 14	9	4½%	Imperial Continental	150—160	124—129	124—125½
1,235,000	,,	Feb. 12	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	80—85	83
235,242	,,	Mar. 26	6½	5⅓%	Lea Bridge Ord. 5 p.c.	119—121	80—83	...
2,498,905	,,	Feb. 26	10	37/6	Liverpool 5 p.c. Ord. A.	211—213	...	...
					Liverpool 5 p.c. Ord. B.	146—148		
306,083	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	...	...	...
165,736	,,	Feb. 26	7/5/6	38⅔%	Maidstone 5 p.c.	...	52—57	...
75,000	5	June 11	6	3%	Malta & Mediterranean	4¼—4½	1¾—2¼	...
250,000	100	April 1	4½	4½%	Met. of Melbourne 4½ p.c. Deb.	99—101	89—96	...
541,920	Stk.	May 27	4	6%	Monte Video, Ltd.	11½—12	70—75	...
1,875,892	,,	Feb. 26	4½	3⅔%	Newcastle & Gatsh'dCon.	98¼—99½	61½—62	61½
529,705	,,	Dec. 30	3½	3½%	Do. 3½ p.c. Deb.	82—83	52—53	...
15,000	10	Mar. 11	8½	8½%	North Middlesex 10 p.c.	...	13—13½	...
55,940	10	,,	7/14/0	6⅓%	,, ,, 7 p.c.	14—15	7½—8½	...
300,000	Stk.	May 13	8	8%	Oriental, Ltd.	117—122	102—105	...
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7¼—7½	3—4	...
60,000	50	Mar. 11	13	7⅓%	Portsea Island, B	128—131	66—71	...
100,000	50	,,	12	6⅔%	Do. C	118—121	53—58	...
249,980	5	April 29	8	—	Primitiva Ord.	5⅛—6	⅛—1⅛	15/—17/6
499,960	5	June 26	5	—	Do. 5 p.c. Pref.	4⅛—5	1⅛—2	30/—35/-
521,600	100	June 1	4	4%	Do. 4 p.c. Deb.	91—93	69—71	69½—70/-
600,000	Stk.	Jan. 29	4	4%	Do. ,, ,, 1911	...	47—50	...
346,198	,,	June 25	4	4%	River Plate 4 p.c. Deb.	85—87	45—48*	...
150,000	10	Mar. 26	6	6/-	San Paulo 6 p.c. Pref.	10½—11	6½—7½	...
125,000	50	July 2	5	5%	San Paulo 5 p.c. Deb.	47—49	38—40*	...
135,000	Stk.	Mar. 11	10	50/-	Sheffield A	223—224	68—73	...
209,984	,,	,,	10	4⅔%	Do. B	222—224	58—63	...
523,500	,,	,,	10	35/5	Do. C	220—222	54—57	54
133,201	Stk.	Sept. 12	4	4%	Shrewsbury 5 p.c.	...	...	...
90,000	10	June 25	9	9%	South African	10½—11¼	11¼—12½*	...
6,609,895	Stk.	Feb. 12	5/4/0	30/-	South Met. 4 p.c. Ord.	111—113	53—56	52½—56
850,000	,,	Jan. 15	—	5%	Do. Pref.	...	93—95	...
1,895,445	,,	,,	3	3%	Do. 3 p.c. Deb.	72½—74½	43—48	...
224,820	,,	Feb. 26	3½	3⅓%	South Shields Con. Stk.	157—159	99—101	...
1,087,795	,,	Aug. 14	6	3½%	S'th Suburb'n Ord. 5 p.c.	114—116	60—65	60½—62
247,558	,,	June 25	5	5%	Do. 5 p.c. Deb. Stk.	116—118	71—76*	...
647,740	,,	May 13	7½	3½%	Southampton Ord.	99—102	57—60	...
121,275	,,	June 25	4	4%	Do. 4 p.c. Deb. Stk.	...	59—61*	...
120,000	,,	Aug. 14	—	3½%	Tottenham District: A 5 p.c.	135—138	60—65	...
782,275	,,	,,	6	2⅔%	Tottenham District: B 3½ p.c.	115—117	50—55	...
181,255	,,	June 10	4	4%	Tottenham District: 4 p.c. Deb.	87—89	60—63	60½
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	...
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	43—50	...
236,476	Stk.	Mar. 11	5	3⅓%	Tynemouth 5 p.c. max.	108½—109	71—73	...
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	Feb. 26	8½	55/-	Wandsworth A 5 p.c.	151—156	83—88	...
255,636	,,	,,	6½	40/-	Do. B 3½ p.c.	129—134	61—66	...
108,075	,,	,,	—	38/6	Do. C	...	61—66	...
140,865	,,	,,	—	38/6	New Ordinary	...	61—66	...
352,000	,,	,,	6½	33/9	Wimbledon 5 p.c.	117—122	60—65	...
98,000	,,	,,	6½	40/-	Epsom 5 p.c.	121—126	60—63	...
88,416	,,	June 25	3	3%	3 p.c. Deb. Stk.	66—69	44—47*	...

* Ex Div.

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